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MONTHLY WEATHER REVIEW

Editor, W. J. HUMPHREYS

VOL. 61, NO. 5
W. B. NO. 1104

MAY 1933

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DROUGHTS IN ARKANSAS

By HARVEY S. COLE

[Weather Bureau Office, Little Rock, Ark.]

In order to study droughts in Arkansas, it was necessary first to decide what should there be considered a drought. A short, dry period that might cause damage in summer would do little or no damage in winter, because evaporation is so much greater in summer than in winter and because the rank growth in summer takes moisture from the soil more rapidly than the scant vegetation in winter. It was found also that a short, dry period that would cause damage in the hills would do no harm in the delta country. The kind of crops raised also make a decided difference as to whether or not any damage is done.

Many pages of data on dry periods on Arkansas were tabulated and studied in connection with weather and crop reports. They were also studied in connection with correlations of corn production and precipitation by Mr. J. Warren Smith; with the effects of droughts in New York as found by Mr. C. D. Reed; and with the facts set out in other papers on droughts. Mr. Smith found that 10 days without rain at and just following the time corn is tasseling reduces the yield appreciably, but that at any other time such a short period has little or no effect on the yield. It is considered unnecessary to tabulate 10-day periods as they only affect very delicate vegetation at a critical period for a very small portion of the year. If they do not occur at one of these critical periods very little harm is done. The large increase in the number of entries of short periods in the tables would not be warranted by any use we see for them.

The tabulations were laid aside for several years, but in the meantime the writer was studying the comments of the weather and crop correspondents on the effect of dry weather on different crops in different portions of Arkansas. The first tabulations were discarded and only used for checking purposes. Twelve stations, as well distributed as practical and having records from 1897 to 1930, inclusive, or as near that as could be found, were selected. In some instances it was necessary to use data for a nearby station, the substitutions being indicated by notes. The stations selected were as follows: Arkansas City, Camden, Calico Rock, Dardanelle, Fort Smith, Fulton, Helena, Little Rock, Mena, Newport, Pocahontas, and Rogers.

It was decided to use all 15-day periods without measurable rainfall during the warmer months, May to September, inclusive, and to use 20-day periods without measurable precipitation during the remainder of the year. It was also decided that periods of over 15 days during the warmer months should be included if the rainfall for the additional days was at a rate less than 1 inch for each additional 15 days and during the remainder of the year dry periods of over 20 days should be included if the precipitation for the additional days was at a rate less than one inch for each additional 30 days. The above rules must be applied with judgment. A 4-inch rain in the middle of a long drought in the warm season will not mature any crops, therefore will not break a drought. Four 1-inch rains, a week or slightly farther apart, will produce good pasture and a hay crop and mature several kinds of truck, and therefore should be considered as breaking the drought.

For convenience in selecting the dry periods two straight lines were drawn on cross section paper, the one for use in the months May to September, the other for the colder months. Days were used as abscissas and amounts of rainfall for ordinates. The line for warm months was drawn from the point indicating 15 days through the intersection of the lines for 30 days and 1 inch rainfall. The line for the colder months was drawn from the point indicated by 20 days through the intersection of the lines for 50 days and 1 inch of rainfall. These lines were extended as far as needed. Such graphs were also found very useful in comparing one drought with another.

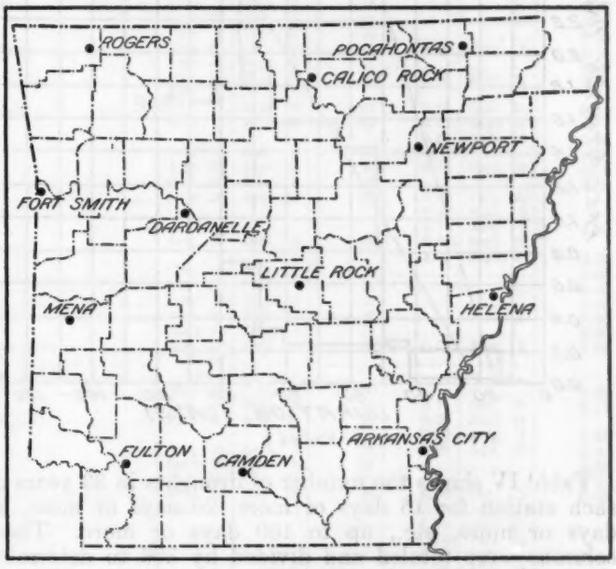

FIGURE 1.—Showing stations in Arkansas whose records were used in this paper

The data used in the preparation of the accompanying tables were obtained from the daily rainfall tables printed in the Weather Bureau bulletins containing monthly climatological data for Arkansas, except in a few instances where the original forms were not received in time to be printed. In such cases, the data were obtained from the original forms.

Table I shows the dates of beginning and ending of all droughts, the number of days duration, the daily amounts of rainfall within the droughts and their dates, and the total precipitation that occurred during the droughts. The droughts for each of the 12 stations are arranged in chronological order for the 33 years.

Table II shows the number of droughts by months in 33 years at the 12 stations for the different durations, 15 to 19 days, 20 to 29 days, 30 to 39 days, etc., to 99 days and for 100 days or more. These numbers were totaled by months and year and the average number of periods per station per month and per year were determined.

Table III gives the number of droughts at each station for the different durations, 15 to 19 days, 20 to 29 days, etc., to 100 days or more, also the greatest droughts on record with the dates of beginning and the amounts of precipitation. The different columns were totaled and the sums divided by 396 (number of years times number of stations), giving the average number of periods of the different durations per station per year.

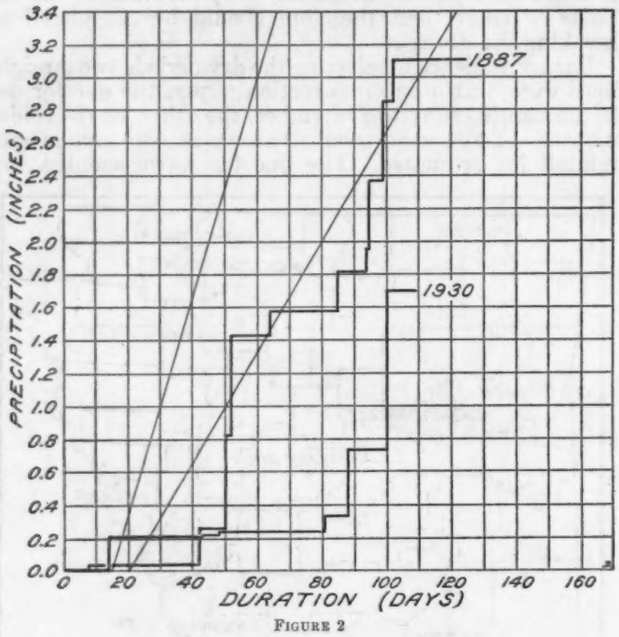

FIGURE 2

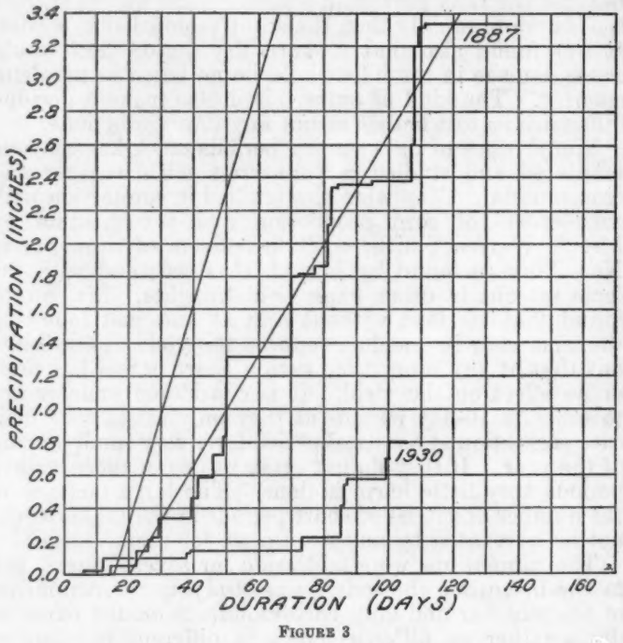

FIGURE 3

Table IV shows the number of droughts in 33 years at each station for 15 days or more, 20 days or more, 30 days or more, etc., up to 100 days or more. These columns were totaled and divided by 396 to determine the number of droughts of different duration per year and the reciprocals of these computed to determine the average number of years per drought of different durations.

Droughts were recorded 844 times at the 12 stations in 33 years, making 2.13 per station per year. Many of these were of short duration, injuring only a few of the many crops. Of these 204 continued from 15 to 19 days with no rain, 365 continued from 20 to 29 days with less than an inch rainfall. The number decreased rapidly from these droughts of short duration to those of longer duration, only 5 of which lasted 90 to 99 days. This would be at a rate of 1 drought of 15 days or more per station in 0.47 year, 1 drought of 20 days or more per station in 0.62 year, 1 of 30 days or more in 1.40 years, 1 of 40 days or more in 2.56 years, 1 of 50 days or more in 3.85 years, 1 of 60 days or more in 6.25 years, 1 of 70 days or more in 8.33 years, 1 of 80 days or more in 14.29 years, 1 of 90 days or more in 25 years, and 1 of 100 days or more in 40 years. Note that we do not have many droughts of 100 or more days. The geographical distribution of droughts varies considerably. The southern section has more droughts than the northern, 93 being recorded at Arkansas City, 70 at Camden, and 83 at Fulton. In the central section, we have 62 at Helena, 58 at Little Rock, 91 at Dardanelle, 65 at Mena, and 66 at Fort Smith. In the northern section 50 were recorded at Pocahontas, 68 at Newport, 75 at Calico Rock, and 63 at Rogers.

Mena is near the Plains States and south of the center of the State where we would expect light rainfall and a large number of droughts, but the average annual precipitation at Mena is over 52 inches, while that for the State as a whole is less that 48. Mena is on a south slope of Rich Mountain which accounts for its heavy rainfall and smaller number of droughts than would be expected. Automatic gages at Little Rock and Fort Smith assure the recording of all amounts of 0.01- or 0.02-inch rainfall. Many of these small amounts are evaporated at substations and recorded as traces. Dardanelle, with 91 droughts, is located 4 miles east-northeast of Mount Nebo, which position accounts for its relatively scanty rainfall and large number of droughts. The heavier rains reach Dardanelle, but the lighter ones do not. Dardanelle and Fort Smith had the same number of 40-day droughts, but Dardanelle had 24 more 15- to 29-day droughts than Fort Smith. The large number of droughts at Calico Rock is accounted for by the fact that there are small mountains south and west of the station.

Ten droughts of 100 days or more were recorded at the 12 stations in the 33-year period. Dardanelle and Fulton had two each. Arkansas City, Fort Smith, Helena, Little Rock, Pocahontas, and Rogers had one each, and Camden, Calico Rock, Mena, and Newport, had none. The longest duration was 126 days at Fulton in 1897, the second longest was 125 days at Dardanelle in 1897. The longest duration in 1930 was 109 days at Fulton, the next longest 107 days, at Little Rock. The longest

drought at Mena was 75 days, in 1930. All other stations had droughts of longer duration.

A drought of longer duration than any of those in the 33-year period occurred at Little Rock in 1887. This drought continued 138 days with 3.34 inches of rainfall. The drought of longest duration, however, is not always the most severe. The 107-day drought at Little Rock in 1930 with only 0.80-inch precipitation probably caused more serious destruction of vegetation and more inconvenience and suffering by men and animals than the 138-day drought at the same place with 3.34 inches rainfall in 1887. Droughts of 100 days or more at 8 stations having such droughts, and the longest droughts on record at the other 4 stations, occurred in the following years: 2 in 1897, 2 in 1901, 1 in 1903, 1 in 1909, 2 in 1910, 1 in 1914, 1 in 1929, and 4 in 1930. It will be noted that longer droughts over small areas have occurred several times since 1897, but such severe droughts have not occurred over nearly so large a portion of the State as those of 1930.

TABLE I.

Arkansas City

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1897	May 14	July 10	58	0.60	June 3	0.60
	July 22	Aug. 5	15			0.00
	Aug. 20	Oct. 30	72	0.60	Oct. 11	0.60
1898	Mar. 30	Apr. 18	20			0.00
	May 4	May 21	18			0.00
	May 24	June 9	17			0.06
	Aug. 7	Aug. 25	19			0.00
1899	Apr. 23	May 10	18			0.00
	Aug. 19	Nov. 21	95	0.45	Sept. 8	
				0.20	Sept. 11	
				1.20	Oct. 11	
				0.10	Oct. 12	
				0.35	Nov. 1	2.30
1900	Aug. 1	Oct. 20	81	0.01	Aug. 22	
				0.05	Aug. 26	
				0.01	Sept. 2	
				0.04	Sept. 9	
				2.02	Sept. 20	
				0.05	Sept. 30	
				0.02	Oct. 5	
				0.03	Oct. 11	2.23
1900	Nov. 21	Jan. 8	49	0.09	Nov. 25	
1901				0.03	Nov. 29	
				0.03	Dec. 3	
				0.02	Dec. 12	
				0.35	Dec. 22	
				0.03	Dec. 27	
				0.01	Dec. 30	
				0.02	Dec. 31	0.58
1901	Mar. 10	Apr. 9	31	0.02	Mar. 19	
				0.02	Mar. 23	
				0.01	Mar. 30	
				0.05	Apr. 1	0.10
	Apr. 18	May 1	22			0.00
	June 7	Aug. 5	60	0.60	June 30	
				0.01	July 23	
				0.05	July 24	
				0.04	July 25	0.70
	Aug. 27	Sept. 10	15			0.00
	Sept. 17	Oct. 10	24			0.00
	Oct. 13	Nov. 20	39	0.10	Nov. 3	
				0.02	Nov. 11	
				0.04	Nov. 18	
				0.02	Nov. 19	0.18
1902	Apr. 17	May 17	41	0.03	Apr. 16	
				0.02	Apr. 23	
				0.15	Apr. 25	
				0.25	May 7	
				0.10	May 12	0.55
	May 31	June 16	17			0.00
	June 19	July 26	38	0.15	July 19	0.15
	Aug. 3	Aug. 31	29	0.15	Aug. 21	
				0.45	Aug. 28	0.60
	Oct. 4	Nov. 3	31	0.01	Oct. 20	
				0.14	Oct. 26	0.15
1903	May 14	May 29	16			0.00
	Aug. 21	Dec. 3	105	0.10	Aug. 30	
				0.20	Sept. 13	
				0.20	Sept. 18	
				0.30	Oct. 5	
				0.12	Oct. 6	
				0.30	Oct. 8	
				0.30	Oct. 13	
				0.70	Nov. 17	2.22
1904	May 18	June 3	17			0.00
	Sept. 3	Sept. 21	19			0.00
	Oct. 7	Nov. 1	26			0.00

TABLE I—Continued

Arkansas City—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1905[1]	July 26	Aug. 12	18			0.00
	Aug. 24	Sept. 10	18			0.00
1906	Jan. 23	Feb. 20	29			0.00
	May 7	May 24	18			0.00
	May 28	June 13	17			0.00
	Oct. 19	Nov. 17	30			0.00
1907	Feb. 5	Feb. 24	20			0.00
	July 31	Aug. 25	26			0.00
	Sept. 16	Oct. 4	19			0.00
	Oct. 9	Oct. 30	22			0.00
	No drought in December at Montrose (nearest station)					
1908	Feb. 26	Mar. 19	23			0.00
	June 15	June 29	15			0.00
	Aug. 26	Sept. 27	33	0.20	Sept. 5	
				0.06	Sept. 20	0.26
	Sept. 29	Nov. 10	43	0.40	Oct. 24	0.40
1909	July 9	Sept. 20	74	0.16	July 23	
				0.20	Aug. 7	
				0.34	Aug. 8	
				0.04	Aug. 12	
				0.24	Aug. 15	
				0.12	Aug. 25	
				0.50	Sept. 11	
				0.30	Sept. 14	1.90
1910	Apr. 18	May 3	16			0.00
	Aug. 16	Oct. 3	49	0.40	Sept. 6	
				0.06	Sept. 29	0.46
	Oct. 28	Dec. 12	46	0.01	Nov. 5	
				0.18	Nov. 16	
				0.16	Nov. 17	
				0.18	Nov. 28	
				0.01	Dec. 5	
				0.04	Dec. 6	0.58
1911	Jan. 3	Jan. 22	20			0.00
	Apr. 29	June 18	51	1.00	May 21	1.00
	Aug. 30	Oct. 9	41	0.02	Sept. 3	0.02
1912	June 3	June 18	16			0.00
	Sept. 23	Oct. 17	25			0.00
	Nov. 8	Nov. 27	20			0.00
1913	June 22	July 10	19	0.16	July 3	0.16
	Aug. 24	Sept. 7	15			0.00
	Oct. 30	Nov. 27	29	0.04	Nov. 17	0.04
	Dec. 29					
1914		Jan. 29	32	0.11	Jan. 24	0.11
	May 9	June 13	36	0.12	May 19	
				0.36	June 4	0.48
	June 18	July 3	16			0.00
	Aug. 29	Sept. 22	25	0.15	Sept. 19	0.15
	Oct. 14	Nov. 8	26			0.00
1915	July 10	Aug. 10	32	0.10	July 20	
				0.10	Aug. 2	
				0.13	Aug. 7	0.33
	Aug. 28	Oct. 4	38	0.62	Sept. 21	
				0.10	Sept. 30	0.72
	Oct. 20	Nov. 8	20			0.00
1916	Oct. 20	Nov. 8	20			0.00
1917	June 10	June 25	16			0.00
1918	Feb. 21	Mar. 18	26			0.00
	May 14	June 1	19			0.00
	July 30	Aug. 19	21	0.04	Aug. 8	0.04
1919	None					
1920	None					
1921	May 16	June 4	20			0.00
	Oct. 4	Nov. 8	36	0.11	Oct. 27	0.11
1922	July 20	Aug. 13	25	0.04	July 24	
				0.02	Aug. 4	0.06
	Aug. 18	Sept. 7	21	0.03	Aug. 23	0.03
	Sept. 18	Oct. 6	19			0.00
	Oct. 10	Oct. 31	22			0.00
1923	Sept. 22	Oct. 16	25	0.10	Oct. 2	0.10
1924	June 18	Sept. 12	87	0.02	July 1	
				0.02	July 11	
				0.10	July 12	
				0.04	July 14	
				0.02	July 15	
				0.02	July 26	
				0.10	July 30	
				0.01	Aug. 8	
				0.92	Aug. 12	
				0.08	Aug. 17	
				0.32	Aug. 18	
				0.20	Aug. 25	
				0.10	Sept. 2	
				0.12	Sept. 9	2.07
	Sept. 23	Dec. 4	73	0.85	Nov. 9	
				0.02	Nov. 12	
				0.01	Nov. 15	
				0.02	Nov. 27	0.90
1925	Mar. 20	May 9	51	0.08	Apr. 4	
				0.05	Apr. 9	
				0.26	Apr. 27	
				0.03	May 8	0.42
	May 25	June 8	15			0.00
	June 20	July 13	24	0.02	June 23	
				0.10	July 6	0.12
	Aug. 15	Sept. 11	28	0.02	Aug. 16	
				0.03	Aug. 22	0.05
	No drought in December at McGehee (nearest station).					

[1] Data for Lake Village used.

TABLE I—Continued

Arkansas City—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1926	May 16	July 7	53	0.17	June 4	
				0.02	June 19	
				0.02	June 25	
				0.86	June 26	
				0.12	June 27	
	Aug. 28	Oct. 4	38	0.04	Sept. 6	
				0.21	Sept. 7	
				0.02	Sept. 15	0.27
1927	June 22	July 7	16			0.00
	Sept. 4	Sept. 18	15			0.00
	Oct. 13	Nov. 8	27	0.10	Nov. 3	0.10
1928	June 24	July 8	15			0.00
	July 29	Aug. 18	21			0.00
	Sept. 2	Oct. 15	44	0.10	Oct. 6	0.10
1929	June 15	July 5	21			0.00
	Aug. 14	Sept. 5	23			0.00
	Sept. 14	Oct. 3	20			0.00
	Oct. 6	Oct. 30	25	0.02	Oct. 20	0.02
1930	May 25	Aug. 10	78	0.20	June 6	
				0.14	June 7	
				0.06	July 3	
				0.12	July 15	
				0.74	July 23	
				0.59	July 24	
				0.37	July 25	
				0.33	Aug. 5	2.55

Camden

				Inches		*Inches*
1897	May 13	May 28	16			0.00
	July 27	Oct. 8	74	0.06	Aug. 5	
				0.10	Aug. 15	
				0.09	Aug. 18	
				0.57	Sept. 9	
				0.30	Sept. 13	
				0.10	Sept. 14	1.32
1898	Mar. 29	Apr. 18	21			0.00
1899	Jan. 14	Feb. 8	26	0.01	Feb. 7	0.01
	Sept. 19	Oct. 9	21			0.00
	Oct. 29	Nov. 19	22			0.00
1900	Jan. 10	Feb. 2	24			0.00
	Sept. 3	Sept. 20	18			0.00
1901	Apr. 19	May 9	21			0.00
	June 9	July 17	39	0.10	July 5	0.10
	Aug. 1	Aug. 19	19			0.00
	Sept. 15	Oct. 3	19			0.00
	Dec. 14					
1902		Jan. 4	22			0.00
	May 31	June 17	18	0.04	June 8	0.04
	Aug. 9	Sept. 10	33	0.14	Sept. 1	0.14
1903	Mar. 20	Apr. 11	23			0.00
	Aug. 30	Oct. 3	35	0.08	Sept. 12	
				0.27	Sept. 16	
				0.12	Sept. 28	0.47
	Nov. 6	Dec. 7	32			0.00
1904	Aug. 27	Sept. 19	24	0.07	Sept. 2	0.07
	Sept. 26	Nov. 1	37	0.12	Oct. 6	
				0.05	Oct. 10	0.17
1905	May 29	June 13	16			0.00
1906	May 17	May 31	15			0.00
	June 3	June 18	16			0.00
	Aug. 11	Sept. 3	24	0.05	Aug. 27	0.05
	Sept. 8	Sept. 24	17	0.02	Sept. 22	0.02
	Oct. 19	Nov. 16	29			0.00
1907	Feb. 3	Feb. 25	23			0.00
	July 13	July 29	17			0.00
1908	June 18	July 19	32	0.26	June 30	
				0.10	July 8	0.36
	Sept. 20	Nov. 22	55	0.35	Oct. 17	0.35
1909	June 25	July 15	21			0.00
1910	No drought.					
1911	Sept. 10	Oct. 8	29			0.00
1912	May 16	June 1	17			0.00
	Sept. 22	Oct. 11	20			0.00
1913	May 24	June 7	15			0.00
	Oct. 30	Nov. 27	29			0.00
1913	Dec. 30	Jan. 23	25	0.01	Jan. 18	0.01
1914	May 9	June 14	37	0.13	May 18	
				0.04	May 27	
				0.05	May 29	
				0.17	June 4	0.39
	June 18	July 2	15			0.00
	Aug. 28	Sept. 18	22			0.00
	Oct. 22	Nov. 26	36	0.01	Nov. 9	
				0.06	Nov. 13	0.07
1915	May 31	June 14	15			0.00
	July 6	July 30	25			0.00
	Aug. 28	Sept. 19	23			0.00
	Sept. 22	Oct. 12	21			0.00
	Oct. 20	Nov. 8	20			0.00
1916	June 7	June 22	16			0.00
	Aug. 15	Sept. 1	18			0.00
	Oct. 20	Nov. 8	20			0.00
1917	June 29	July 15	17	0.01	July 6	0.01
1918	No drought.					

TABLE I—Continued

Camden—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
1919	No drought.					
1920	....do.			*Inches*		*Inches*
1921	May 15	June 3	20			0.00
	Oct. 4	Nov. 15	43	0.17	Oct. 26	
				0.02	Oct. 31	
				0.05	Nov. 9	
				0.01	Nov. 14	0.25
1922	June 12	June 26	15			0.00
	Aug. 15	Sept. 6	23	0.01	Aug. 27	0.01
	Sept. 17	Oct. 5	19			0.00
	Oct. 9	Nov. 5	28	0.01	Oct. 16	
				0.01	Nov. 1	0.02
1923	June 18	July 12	25	0.05	June 23	
				0.06	July 10	0.11
	Aug. 1	Aug. 23	23			0.00
1924	July 13	Aug. 16	35	0.32	Aug. 12	0.32
	Sept. 29	Nov. 7	40	0.07	Oct. 31	0.07
1925	May 12	June 30	50	0.28	May 24	
				0.01	June 8	
				0.04	June 9	
				0.31	June 10	
				0.05	June 13	
				0.09	June 25	0.78
	Aug. 1	Sept. 23	54	0.45	Aug. 14	
				0.17	Aug. 15	
				0.29	Sept. 12	0.91
1926	May 15	May 31	17			0.00
1927	Aug. 11	Aug. 27	17			0.00
	Sept. 3	Sept. 18	16			0.00
1928	July 31	Aug. 24	25	0.01	Aug. 20	0.01
	Sept. 2	Oct. 2	31	0.28	Sept. 16	0.28
1929	May 31	July 9	40	0.01	June 22	
				0.01	June 25	
				0.04	July 3	
				0.02	July 5	
				0.13	July 6	0.21
	Aug. 2	Oct. 27	87	0.71	Sept. 7	
				0.01	Sept. 9	
				0.81	Sept. 13	
				0.09	Oct. 4	
				0.40	Oct. 5	
				0.07	Oct. 14	
				0.10	Oct. 15	
				0.02	Oct. 21	2.21
1930	June 7	Aug. 15	70	0.05	June 16	
				0.06	July 10	0.11

Calico Rock

[Calico Rock, 1905–1930; Dodd City, 1903–1904; Oregon, August to December, inclusive 1902; Keesee's Ferry, 1897-July, inclusive, 1902]

				Inches		*Inches*
1897	May 10	May 26	17			0.00
	Aug. 11	Oct. 30	81	0.01	Aug. 14	
				0.36	Oct. 10	
				0.05	Oct. 11	0.42
1898	No drought.					
1899	July 31	Oct. 9	71	0.09	Aug. 4	
				0.04	Aug. 26	
				0.60	Aug. 27	
				0.09	Sept. 8	
				0.11	Sept. 17	
				0.05	Sept. 23	0.98
1900	July 30	Aug. 21	23			0.00
1901	Feb. 12	Mar. 7	24			0.00
	Apr. 19	May 15	27	0.05	Apr. 25	
				0.03	May 5	0.08
	May 20	July 25	67	0.28	June 6	
				0.04	June 8	
				0.02	June 9	
				0.04	June 13	
				0.64	June 27	
				0.24	July 5	1.26
	Aug. 27	Nov. 2	68	0.32	Sept. 11	
				0.45	Oct. 8	
				0.10	Oct. 12	
				0.13	Oct. 26	1.00
1901	Dec. 18	Jan. 19	33			0.00
1902	July 1	July 18	18			0.00
1903	Dec. 25	Jan. 20	27			0.00
1904	May 18	June 2	16			0.00
	Aug. 2	Aug. 16	15			0.00
	Aug. 18	Sept. 1	15			0.00
	Sept. 3	Sept. 23	21			0.00
	Sept. 25	Nov. 30	67	0.50	Oct. 25	
				0.10	Nov. 2	
				0.10	Nov. 9	
				0.10	Nov. 10	0.80
1905	May 31	June 20	21			0.00
	Sept. 20	Oct. 16	27	0.10	Oct. 3	0.10
1906	May 6	May 31	26	0.15	May 25	0.15
	June 27	July 11	15			0.00
	July 23	Aug. 6	15			0.00
	Oct. 19	Nov. 10	23			0.00

TABLE I—Continued

Calico Rock—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1907	July 13	Aug. 17	36			0.00
	Sept. 11	Oct. 3	23			0.00
1908	June 6	July 25	50	0.01	June 10	
				0.01	June 14	
				0.04	June 29	
				0.01	July 3	
				0.08	July 18	
				0.06	July 20	0.21
1908	Aug. 24	Sept. 20	28	0.04	Sept. 5	0.04
	Sept. 28	Oct. 23	26			0.00
1908–1909	Dec. 1	Jan. 11	42	0.30	Dec. 30	
				0.20	Jan. 5	0.50
	Mar. 10	Apr. 12	34	0.24	Apr. 6	0.24
	July 10	July 27	18			0.00
	Aug. 17	Sept. 4	19			0.00
	Sept. 23	Oct. 19	27	0.08	Oct. 9	
				0.12	Oct. 10	0.20
1910	Jan. 21	Feb. 16	27			T.
	Mar. 11	Apr. 2	23			0.00
	Apr. 18	May 5	18			0.00
	Sept. 7	Sept. 25	19			0.00
	Oct. 14	Dec. 22	71	0.08	Nov. 4	
				0.10	Nov. 5	
				0.30	Dec. 6	0.48
1911	Mar. 2	Mar. 25	24			0.00
	Apr. 28	May 18	21			0.00
	May 22	June 22	32			0.00
1912	Jan. 20	Feb. 8	20			0.00
	Apr. 28	June 12	46	0.10	May 11	
				0.40	May 29	0.50
	July 4	Aug. 8	36			0.00
	Aug. 18	Sept. 16	30			0.00
	Sept. 22	Oct. 31	40	0.20	Oct. 12	
				0.25	Oct. 18	
				0.20	Oct. 22	0.65
1912–1913	Nov. 7	Jan. 5	60	0.30	Dec. 23	
				0.10	Dec. 24	
				0.20	Dec. 29	0.60
	May 7	July 9	64	0.52	June 22	0.52
	July 27	Aug. 10	15			0.00
	Aug. 12	Sept. 11	31			0.00
1913–1914	Dec. 26	Jan. 23	29			0.00
	May 13	Aug. 11	91	0.15	June 17	
				0.20	July 2	
				0.70	July 4	
				0.95	July 13	2.00
	Sept. 24	Oct. 9	16			0.00
1915	May 30	June 13	15			0.00
	July 14	Aug. 3	21			0.00
	Aug. 28	Sept. 27	31	0.25	Sept. 18	0.25
	Oct. 19	Nov. 11	24			0.00
1916	June 20	July 30	41	0.45	July 18	
				0.40	July 21	0.85
	Aug. 15	Sept. 1	18			0.00
1917	Jan. 16	Feb. 14	30			0.00
	May 5	May 21	17			0.00
	Sept. 10	Sept. 26	17			0.00
	Oct. 31	Nov. 27	28			0.00
1918	Feb. 13	Apr. 3	50	0.14	Mar. 1	
				0.10	Mar. 22	0.24
	July 1	July 16	16			0.00
	Aug. 18	Sept. 11	25	0.03	Aug. 23	0.03
1918–1919	Dec. 8	Jan. 6	30	0.01	Dec. 23	0.01
1920	Jan. 24	Feb. 28	36	0.19	Feb. 10	
				0.14	Feb. 14	0.33
1921	May 12	June 2	22	0.01	May 29	0.01
1922	Sept. 21	Oct. 6	16			0.00
1923	June 29	July 13	15			0.00
1924	Sept. 23	Nov. 11	50	0.06	Sept. 28	
				0.15	Oct. 6	
				0.07	Oct. 31	0.28
1925	Aug. 22	Sept. 11	21	0.01	Sept. 1	0.01
1926	No drought.					
1927	Sept. 4	Sept. 26	23			0.00
1928	Sept. 16	Oct. 1	16			0.00
1929	July 12	Oct. 3	84	0.02	Aug. 7	
				0.23	Aug. 9	
				0.52	Aug. 10	
				0.05	Aug. 12	
				0.02	Sept. 6	
				0.21	Sept. 7	
				0.04	Sept. 12	
				0.78	Sept. 13	
				0.06	Sept. 21	1.93
1930	July 2	Aug. 13	43	0.46	July 25	
				0.02	July 31	
				0.04	Aug. 5	
				0.08	Aug. 11	0.60

TABLE I—Continued

Dardanelle

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1897	May 11	May 28	18			0.00
	June 8	June 25	18			0.00
	June 27	July 17	21			0.00
	July 22	Aug. 8	18			0.00
	Aug. 16	Dec. 18	125	0.40	Sept. 16	
				0.39	Oct. 11	
				0.10	Oct. 31	
				0.28	Nov. 4	
				0.48	Nov. 15	
				0.10	Nov. 24	
				0.15	Dec. 1	
				0.10	Dec. 2	
				0.35	Dec. 17	2.35
1898	Aug. 10	Sept. 10	32	0.14	Aug. 19	
				0.10	Sept. 7	0.24
1899	Jan. 14	Feb. 24	42	0.05	Jan. 31	0.05
	July 23	Oct. 9	79	0.10	Aug. 14	
				0.91	Aug. 28	1.01
	Oct. 29	Nov. 18	21			0.00
1900	July 22	Aug. 22	32			0.00
	Nov. 2	Nov. 22	21			0.00
	Nov. 25	Dec. 18	24			0.00
1901	Feb. 12	Mar. 8	25			0.00
	Apr. 19	July 30	103	0.05	May 13	
				0.18	May 20	
				0.15	May 25	
				0.05	May 31	
				1.15	June 8	
				0.15	June 12	
				0.08	June 19	
				0.20	June 26	
				0.20	June 26	
				0.10	June 29	
				0.13	July 1	
				0.52	July 14	
				0.62	July 26	3.38
	Aug. 12	Sept. 11	31			0.00
1901–1902	Dec. 15	Jan. 17	34			0.00
	Jan. 28	Feb. 18	22			0.00
	June 1	June 16	16			0.00
	June 30	July 14	15			0.00
	Aug. 12	Sept. 5	25			0.00
	Oct. 5	Oct. 26	22			0.00
1903	Jan. 6	Jan. 26	21			0.00
	June 2	July 23	52	0.20	June 26	
				0.10	June 27	
				0.08	July 4	
				0.20	July 11	
				0.26	July 12	
				0.28	July 13	1.12
	Aug. 30	Sept. 13	15			0.00
	Oct. 7	Dec. 11	66	0.01	Oct. 29	
				0.04	Oct. 30	
				0.08	Oct. 31	
				0.12	Nov. 1	
				0.06	Nov. 5	
				0.24	Dec. 1	0.55
1903–1904	Dec. 25	Jan. 20	27			0.00
	Jan. 24	Feb. 17	25			0.00
	Aug. 27	Sept. 18	23			0.00
	Oct. 7	Dec. 22	77	0.10	Nov. 3	
				0.08	Nov. 4	
				0.04	Nov. 21	
				0.01	Dec. 3	
				0.20	Dec. 4	
				0.10	Dec. 14	0.53
1905	Aug. 20	Sept. 6	18			0.00
1906	May 8	May 22	15			0.00
	Oct. 17	Nov. 16	31			0.00
1907	Feb. 1	Feb. 23	23			0.00
	July 1	Aug. 17	48	0.16	July 11	
				0.26	Aug. 5	0.42
	Aug. 25	Sept. 8	15			0.00
	Oct. 8	Nov. 17	41	0.04	Oct. 30	0.04
1908	June 18	Aug. 3	47	0.12	July 3	
				0.12	July 7	
				0.08	July 14	
				0.52	July 20	
				0.20	July 25	
				0.32	July 28	1.36
	Aug. 21	Sept. 4	15			0.00
	Sept. 29	Nov. 1	34			0.00
	Dec. 1	Dec. 29	29			0.00
1909	July 16	Aug. 6	22			0.00
	Aug. 9	Sept. 4	27			0.00
	Sept. 23	Oct. 8	16			0.00
1910	Jan. 19	Feb. 16	29			0.00
1911	May 2	May 19	18			0.00
1912	Nov. 7	Dec. 22	46	0.04	Nov. 27	
				0.04	Dec. 2	0.08
1913	Aug. 1	Sept. 7	38	0.02	Aug. 11	
				0.04	Aug. 12	
				0.14	Aug. 21	.20

TABLE I—Continued

Dardanelle—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1913	Dec. 29	Jan. 29	32	0.10	Jan. 24	0.10
1914	May 14	July 1	49	0.02	May 17	
				0.18	May 28	
				0.33	June 16	
				0.10	June 17	0.63
	July 9	July 31	23	0.05	July 18	0.05
	Sept. 5	Oct. 8	34	0.18	Sept. 20	
				0.20	Sept. 23	0.38
	Oct. 22	Nov. 26	36	0.04	Nov. 8	0.04
1915	June 30	July 31	32	0.12	July 3	
				0.08	July 9	
				0.12	July 19	0.32
	Oct. 18	Nov. 10	24			0.00
1916	Feb. 1	Feb. 22	22			0.00
	Mar. 3	Mar. 24	22			0.00
1917	Jan. 23	Feb. 14	23			0.00
	May 5	May 20	16			0.00
	Sept. 28	Oct. 18	21			0.00
1918	Mar. 5	Apr. 3	30			0.00
	June 10	June 28	19			0.00
	July 24	Aug. 7	15			0.00
1919	July 10	Aug. 14	26	0.12	Aug. 1	0.12
	Aug. 31	Sept. 19	20			0.00
1919	Dec. 8	Jan. 5	29			0.00
1920	Jan. 24	Mar. 3	40	0.02	Feb. 11	
				0.18	Feb. 14	
				0.02	Feb. 15	
				0.35	Feb. 29	0.55
	Aug. 10	Aug. 25	16			0.00
	Sept. 14	Oct. 13	30			0.00
	Nov. 11	Dec. 5	25	0.01	Nov. 30	
				0.05	Dec. 3	0.06
1921	May 12	May 27	16			0.00
	Aug. 15	Aug. 31	17			0.00
	Sept. 26	Nov. 15	51	0.38	Oct. 29	
				0.25	Nov. 9	0.63
1922	May 23	June 7	16			0.00
	June 11	June 26	16			0.00
	Aug. 28	Oct. 5	39	0.61	Sept. 11	
				0.21	Sept. 20	0.82
	Oct. 8	Oct. 31	24			0.00
1923	June 29	July 13	13			0.00
	Sept. 21	Oct. 15	25			0.00
1924	May 1	May 20	20			0.00
	Aug. 17	Sept. 1	16			0.00
	Oct. 7	Nov. 11	36			0.00
1925	May 15	June 7	24			0.00
	June 9	July 5	27			0.00
	Aug. 10	Sept. 11	33			0.00
	Dec. 15					
1926		Jan. 16	33			0.00
	Jan. 23	Feb. 17	26			0.00
	May 12	June 3	23			0.00
	June 17	July 7	21			0.00
	July 28	Aug. 11	15			0.00
	Aug. 25	Sept. 22	29			0.00
1927	No drought.					
1928	Aug. 26	Oct. 4	40	0.44	Sept. 11	0.44
1929	July 9	Sept. 4	58	0.03	July 27	
				0.10	July 30	
				0.39	July 31	
				0.10	Aug. 10	
				0.06	Aug. 13	
				0.13	Aug. 22	0.81
1930	June 18	Aug. 3	47	0.02	June 24	
				0.10	July 24	
				0.10	July 31	0.22

Fort Smith

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
1897	May 12	May 26	15			0.00
	Aug. 15	Sept. 8	25	0.04	Aug. 30	0.04
	Sept. 17	Oct. 9	23			0.00
1898	No drought.					
1899	July 24	Oct. 15	84	1.15	Aug. 14	
				0.03	Sept. 10	
				0.31	Sept. 17	
				0.01	Oct. 10	1.50
1900	July 25	Aug. 24	31	0.03	Aug. 22	0.03
	Nov. 25	Dec. 18	24	0.01	Dec. 3	
				0.02	Dec. 7	0.03
1901	Feb. 12	Mar. 7	24	0.02	Feb. 22	0.02
	June 20	July 4	15			0.00
	Aug. 12	Oct. 3	53	0.01	Aug. 27	
				0.12	Sept. 1	
				0.03	Sept. 11	
				0.01	Sept. 12	
				0.01	Sept. 13	
				0.25	Sept. 14	0.43
1902	May 31	June 16	17			0.00
	July 1	July 24	24	0.01	July 4	
				0.21	July 12	
				0.08	July 20	0.30
	Aug. 12	Aug. 31	20			0.00

TABLE I—Continued

Fort Smith—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1903	Mar. 29	May 5	38	0.16	Apr. 7	
				0.08	Apr. 10	
				0.01	Apr. 12	
				0.01	Apr. 13	
				0.08	Apr. 18	
				0.02	Apr. 29	0.36
	June 4	June 18	15			0.00
	July 5	July 31	27	0.01	July 15	
				0.11	July 29	
				0.07	July 30	0.19
	Aug. 30	Sept. 15	17	0.18	Sept. 10	
				0.01	Sept. 14	0.19
	Nov. 6	Dec. 11	36	0.10	Dec. 1	0.10
1903	Dec. 25	Jan. 19	26	0.03	Jan. 16	0.03
1904						
1904	Oct. 5	Jan. 7	95	0.44	Oct. 25	
1905				0.18	Nov. 3	
				0.06	Nov. 11	
				0.02	Nov. 20	
				0.02	Dec. 3	
				0.20	Dec. 5	
				0.01	Dec. 6	
				0.10	Dec. 14	
				0.01	Dec. 16	
				0.11	Dec. 23	
				0.03	Dec. 26	
				0.07	Dec. 27	1.25
1906	Oct. 19	Nov. 9	22			0.00
1907	Feb. 1	Feb. 22	22			0.00
	July 14	Sept. 1	50	0.17	July 28	
				0.29	Aug. 4	
				0.08	Aug. 12	
				0.13	Aug. 22	
				0.02	Aug. 30	0.69
	Oct. 8	Oct. 28	21			0.00
1908	Sept. 28	Oct. 18	21			0.00
1908	Nov. 30	Feb. 4	67	0.09	Dec. 29	
1909				0.06	Jan. 4	
				0.42	Jan. 11	
				0.05	Jan. 12	
				0.04	Jan. 15	
				0.02	Jan. 21	
				0.02	Jan. 25	
				0.01	Jan. 27	0.71
	July 16	Oct. 7	84	0.03	July 22	
				0.01	Aug. 8	
				0.05	Aug. 13	
				0.76	Aug. 24	
				0.01	Sept. 1	
				0.31	Sept. 5	
				0.02	Sept. 6	
				0.03	Sept. 14	
				0.01	Sept. 21	1.23
1910	July 13	Aug. 3	22	0.01	July 23	
				0.01	July 30	
				0.05	July 31	0.07
1910	Oct. 21	Feb. 9	112	0.05	Oct. 26	
1911				0.03	Oct. 27	
				0.35	Nov. 15	
				0.09	Nov. 26	
				0.01	Nov. 27	
				0.04	Dec. 4	
				0.06	Dec. 22	
				0.18	Dec. 27	
				0.09	Dec. 28	
				0.22	Dec. 29	
				0.10	Jan. 17	
				0.18	Jan. 18	
				0.12	Jan. 28	1.52
	May 21	July 7	48	0.21	June 17	
				0.02	June 18	
				0.01	June 22	
				0.01	June 25	
				0.20	June 29	0.45
1912	Jan. 19	Feb. 19	32	0.02	Feb. 9	
				0.09	Feb. 17	0.11
	Aug. 16	Oct. 29	75	0.01	Aug. 25	
				0.07	Sept. 11	
				0.34	Sept. 17	
				0.70	Sept. 20	
				0.74	Sept. 21	
				0.03	Sept. 24	
				0.06	Oct. 11	
				0.09	Oct. 17	
				0.12	Oct. 21	2.16
1912	Nov. 7	Jan. 5	60	0.05	Nov. 27	
1913				0.13	Dec. 1	
				0.04	Dec. 3	
				0.11	Dec. 22	
				0.21	Dec. 23	0.54
	Aug. 2	Sept. 7	37	0.02	Aug. 12	0.02
1913	Dec. 29	Jan. 28	31	0.03	Jan. 25	0.03
1914						
	June 1	July 1	31	0.05	June 11	
				0.32	June 16	
				0.01	June 29	0.38
	Oct. 21	Nov. 26	37	0.10	Nov. 9	0.10

TABLE I—Continued

Fort Smith—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1915	Aug. 29	Sept. 18	21	0.01	Sept. 16	0.01
	Oct. 18	Nov. 10	24			0.00
1916	Mar. 2	Mar. 24	23	0.01	Mar. 23	0.01
	July 1	Aug. 30	61	0.13	July 18	
				0.13	July 19	
				0.18	July 20	
				0.03	Aug. 8	
				0.09	Aug. 13	
				0.03	Aug. 14	
				0.02	Aug. 27	0.51
1917	June 9	June 30	22	0.10	June 21	
				0.07	June 24	0.17
	Sept. 28	Nov. 25	59	0.03	Oct. 7	
				0.01	Oct. 17	
				0.09	Oct. 27	
				0.07	Oct. 28	
				0.20	Nov. 10	
				0.06	Nov. 17	
				0.47	Nov. 18	
				0.07	Nov. 19	1.00
1917–1918	Nov. 29	Jan. 5	38	0.36	Dec. 7	0.36
1918	Mar. 4	Mar. 27	24			0.00
	June 9	June 26	18			0.00
	July 12	Aug. 28	48	0.02	July 17	
				0.02	July 18	
				0.07	Aug. 7	
				0.01	Aug. 16	
				0.15	Aug. 23	
				0.03	Aug. 24	0.30
1919	July 3	Aug. 2	31	0.07	July 27	0.07
	Aug. 30	Oct. 3	35	0.01	Sept. 11	
				0.08	Sept. 18	
				0.02	Sept. 19	
				0.43	Sept. 21	
				0.02	Sept. 22	0.56
1919–1920	Dec. 7	Jan. 4	29			0.00
1921	Sept. 26	Nov. 15	51	0.01	Sept. 29	
				0.06	Oct. 28	
				0.06	Oct. 29	
				0.01	Oct. 30	
				0.07	Nov. 8	
				0.01	Nov. 9	0.22
1922	July 13	Aug. 2	21	0.01	July 26	0.01
	Sept. 11	Oct. 5	25			0.00
1923	June 16	July 12	27	0.01	June 19	
				0.01	June 28	0.02
	July 21	Aug. 31	42	0.02	July 25	
				0.01	July 26	
				0.02	July 30	
				0.04	Aug. 8	
				0.07	Aug. 21	
				0.18	Aug. 22	0.34
1924	Apr. 30	May 22	23	0.03	May 6	
				0.03	May 7	
				0.01	May 13	0.07
	Aug. 11	Sept. 11	32	0.01	Aug. 16	
				0.03	Aug. 18	
				0.31	Aug. 31	
				0.09	Sept. 1	0.44
	Oct. 10	Nov. 13	35	0.02	Oct. 30	
				0.05	Nov. 7	
				0.03	Nov. 9	
				0.06	Nov. 11	0.16
1925	Feb. 26	Mar. 28	31	0.03	Mar. 9	
				0.04	Mar. 10	
				0.07	Mar. 13	0.14
	Aug. 10	Sept. 9	31	0.12	Aug. 20	0.12
1926	July 27	Aug. 14	19			0.00
	Sept. 10	Sept. 24	15			0.00
1927	June 21	July 12	22	0.03	June 30	0.03
	Aug. 30	Sept. 22	24			0.00
1928	Aug. 31	Oct. 2	33	0.05	Sept. 10	0.05
1929	July 10	Sept. 3	56	0.08	Aug. 12	
				0.04	Aug. 25	0.12
	Sept. 13	Oct. 9	27	0.06	Oct. 4	0.06
1930	July 4	Sept. 7	66	0.05	July 30	
				0.36	July 31	
				0.09	Aug. 11	
				0.01	Aug. 15	
				0.04	Aug. 30	
				0.84	Aug. 31	1.39

Fulton

[Fulton, 1897–June, inclusive, 1898; February, inclusive, 1905–1930; Washington, July 1898–January 1904, inclusive; Hope, February 1904–January 1905, inclusive]

				Inches		*Inches*
1897	June 8	Oct. 11	126	0.03	June 15	
				0.23	July 19	
				0.57	July 27	
				0.60	July 29	
				0.15	Aug. 10	
				0.24	Aug. 31	
				0.15	Sept. 9	
				0.40	Sept. 10	
				0.49	Sept. 14	
				0.25	Sept. 17	3.11

TABLE I—Continued

Fulton—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1898	Feb. 19	Mar. 11	21			0.00
	July 8	July 24	17			0.00
1899	July 24	Oct. 9	78	0.09	Aug. 14	
				0.10	Aug. 17	
				0.54	Aug. 27	
				0.10	Sept. 6	
				0.04	Sept. 8	
				0.19	Sept. 10	
				0.22	Sept. 11	
				0.04	Sept. 17	
				0.07	Sept. 18	1.39
1900	Aug. 1	Aug. 25	25	0.06	Aug. 6	
				0.02	Aug. 19	0.08
	Aug. 31	Sept. 19	20	0.04	Sept. 9	0.04
1901	Apr. 19	May 11	23			0.00
	Sept. 15	Oct. 7	23			0.00
1901–1902	Dec. 15	Jan. 3	20			0.00
	June 30	July 14	15			0.00
	Aug. 1	Aug. 31	31	0.03	Aug. 6	
				0.02	Aug. 8	
				0.03	Aug. 27	0.08
1903	Mar. 28	May 4	38	0.03	Apr. 11	
				0.43	Apr. 29	0.46
	Oct. 17	Dec. 11	56	0.01	Oct. 29	
				0.01	Nov. 4	
				0.02	Nov. 5	
				0.02	Nov. 25	
				0.10	Dec. 4	0.16
1904	Aug. 8	Aug. 25	18			0.00
	Sept. 5	Sept. 19	15			0.00
	Sept. 23	Nov. 1	40	0.39	Oct. 5	
				0.16	Oct. 11	0.55
1905	No drought.					
1906	June 26	July 10	15			0.00
	Sept. 17	Oct. 4	18			0.00
	Oct. 15	Nov. 15	32	0.20	Nov. 7	0.20
1907	Feb. 2	Feb. 24	23			0.00
	June 5	June 20	16			0.00
	July 12	Aug. 21	41			0.00
	Sept. 10	Oct. 2	23			0.00
1908	Jan. 11	Jan. 30	20			0.00
	June 17	July 7	21			0.00
	Aug. 18	Sept. 13	27			0.00
	Sept. 29	Nov. 1	34			0.00
1909	July 18	Aug. 6	20			0.00
	Aug. 8	Aug. 24	17			0.00
	Sept. 6	Sept. 20	15			0.00
1910	July 3	Aug. 4	33			0.00
	Aug. 22	Sept. 5	15			0.00
	Sept. 7	Oct. 4	28	0.12	Sept. 28	0.12
	Oct. 22	Dec. 11	51	0.12	Nov. 10	
			51	0.08	Nov. 16	
				0.20	Nov. 28	0.40
1911	Jan. 4	Jan. 23	20			0.00
	May 22	June 21	31			0.00
	Aug. 30	Oct. 15	47	0.28	Sept. 13	
				0.25	Sept. 21	
				0.18	Oct. 5	0.71
1912	July 3	July 30	28	0.16	July 20	0.16
	Aug. 28	Sept. 17	21			0.00
	Sept. 22	Oct. 17	26			0.00
	Nov. 7	Dec. 1	25			0.00
1913	May 23	June 7	16			0.00
	Oct. 28	Nov. 22	26			0.00
	Dec. 29					
1914		Jan. 29	32			0.00
	May 29	Aug. 1	65	0.66	June 17	
				0.43	July 7	
				0.07	July 8	
				0.66	July 9	1.82
	Aug. 27	Nov. 26	92	0.41	Sept. 24	
				0.04	Oct. 1	0.45
1915	July 10	July 31	22			0.00
	Aug. 29	Oct. 12	45	1.15	Sept. 21	1.15
	Oct. 19	Nov. 7	20			0.00
1916	Mar. 2	Mar. 24	23			0.00
	June 27	July 15	19			0.00
	Aug. 11	Oct. 13	64	0.18	Aug. 23	
				0.05	Sept. 3	
				0.43	Sept. 9	
				0.18	Sept. 12	
				0.04	Sept. 23	0.88
	Oct. 20	Nov. 8	20			0.00
1917	June 28	July 14	17	0.00	July 6	0.01
	Sept. 18	Oct. 7	20			0.00
	Oct. 28	Nov. 18	22			0.00
1918	July 14	Aug. 6	24	0.05	July 29	
				0.15	July 30	0.20
1919	June 4	June 19	16			0.00
	July 3	Aug. 8	37			0.00
	Aug. 31	Sept. 20	21			0.00
1920	July 21	Aug. 9	20	0.07	July 29	0.07
	Sept. 24	Oct. 14	21			0.00
1921	May 16	June 7	23			0.00
	July 22	Aug. 8	18			0.00
	Sept. 10	Sept. 25	16			0.00
	Oct. 4	Nov. 15	43	0.08	Oct. 31	0.08
1922	June 12	June 26	15			0.00
	July 4	Aug. 2	30	0.36	July 26	0.36
	Aug. 26	Oct. 6	42	0.05	Sept. 7	
				0.16	Sept. 11	0.21
1923	Aug. 1	Aug. 18	18			0.00

TABLE I—Continued

Fulton—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1924	June 23	Sept. 11	81	0.15	July 10	
				0.38	Aug. 7	
				0.11	Aug. 18	
				0.08	Aug. 25	
				0.47	Sept. 2	1.20
	Sept. 23	Nov. 7	46	0.04	Sept. 28	
				0.06	Oct. 31	0.10
1925	May 25	June 8	15			0.00
	Aug. 16	Sept. 11	27			0.00
1926	May 16	May 31	16			0.00
	Sept. 8	Sept. 22	15			0.00
	Nov. 16	Dec. 6	21			0.00
1927	Aug. 11	Aug. 28	18			0.00
	Sept. 4	Sept. 18	15			0.00
1928	Aug. 6	Oct. 1	57	0.34	Aug. 26	
				0.12	Aug. 31	
				0.25	Sept. 11	0.71
1929	Aug. 3	Sept. 12	41	0.10	Aug. 13	
				0.12	Sept. 6	
				0.15	Sept. 9	0.37
	Sept. 14	Oct. 3	20			0.00
1930	May 24	Sept. 9	109	0.21	June 6	
				0.02	July 5	
				0.02	July 10	
				0.09	Aug. 12	
				0.40	Aug. 19	
				0.95	Aug. 31	1.69

Helena

1897	May 14	June 2	20			0.00
	Aug. 21	Oct. 28	69	0.45	Oct. 11	
				0.06	Oct. 12	0.51
1898	No drought.					
1899	Aug. 29	Nov. 19	83	0.01	Sept. 12	
				0.10	Sept. 18	
				0.37	Sept. 19	
				0.06	Oct. 11	
				0.25	Oct. 12	
				0.05	Oct. 17	
				0.38	Oct. 28	
				0.02	Oct. 29	
				0.07	Nov. 2	
				0.08	Nov. 14	1.39
1900	July 31	Aug. 20	21	0.01	Aug. 1	0.01
1901	June 8	Aug. 10	64	0.02	June 25	
				0.30	July 18	
				0.26	July 31	
				0.10	Aug. 5	
				0.50	Aug. 6	1.18
	Aug. 28	Sept. 11	15			0.00
	Sept. 18	Oct. 8	21			0.00
	Oct. 14	Nov. 2	20			0.00
1901–1902	Dec. 29	Jan. 19	23			0.00
	June 29	July 27	29	0.40	July 21	0.40
	Aug. 3	Sept. 10	39	0.52	Aug. 28	
				0.22	Sept. 2	0.74
1903	June 2	June 21	20			0.00
	Sept. 18	Dec. 8	82	0.13	Oct. 6	
				0.11	Oct. 14	
				0.08	Nov. 2	
				0.59	Nov. 5	
				0.09	Nov. 12	
				0.10	Nov. 17	
				0.12	Dec. 2	1.22
1904	Aug. 27	Sept. 19	24	0.04	Sept. 3	0.04
	Oct. 12	Nov. 2	22			0.00
1905	No drought.					
1906	Oct. 19	Nov. 13	26	0.02	Nov. 8	0.02
1907	July 13	July 27	15			0.00
1908	June 15	June 29	15			0.00
	Aug. 25	Sept. 25	32	0.08	Sept. 5	
				0.02	Sept. 22	0.10
	Sept. 29	Nov. 10	43	0.12	Oct. 24	0.12
1909	July 24	Sept. 20	59	0.16	Aug. 6	
				0.08	Aug. 8	
				0.10	Aug. 12	
				0.10	Sept. 5	
				0.06	Sept. 14	0.50
	Sept. 24	Oct. 16	23			0.00
1910	July 19	Aug. 7	20	0.04	Aug. 4	0.04
	Aug. 22	Oct. 3	43	0.16	Sept. 3	
				0.08	Sept. 6	
				0.40	Sept. 22	0.64
	Nov. 7	Nov. 26	20			0.00
1911	May 2	June 18	48	0.20	May 19	
				0.12	May 21	0.32
	Aug. 28	Sept. 30	34	0.22	Sept. 11	
				0.20	Sept. 21	
				0.14	Sept. 22	0.56
1912	Aug. 29	Sept. 14	17			0.00
	Sept. 28	Oct. 17	20			0.00
1913	June 3	June 28	21			0.00
	Oct. 30	Nov. 28	30	0.08	Nov. 17	0.08
1913–1914	Dec. 30	Jan. 18	20			0.00

TABLE I—Continued

Helena—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1914	May 6	Aug. 2	89	0.05	May 11	
				0.15	May 31	
				1.04	June 16	
				0.12	July 6	
				0.01	July 15	
				0.05	July 18	
				0.23	July 19	
				0.16	July 30	1.81
1915	July 10	Aug. 2	24			0.00
	Aug. 30	Sept. 20	22			0.00
	Oct. 20	Nov. 11	23			0.00
1916	May 4	May 20	17			0.00
	Sept. 25	Oct. 17	23			0.00
1917	June 10	July 6	27			0.00
	Aug. 23	Sept. 15	24	0.03	Aug. 31	0.03
	Sept. 19	Oct. 25	37	0.45	Oct. 8	
				0.08	Oct. 19	0.53
1917–1918	Dec. 9	Jan. 5	28	0.05	Dec. 31	0.05
	May 14	June 1	19			0.00
	June 8	Aug. 19	73	0.44	June 26	
				0.36	June 28	
				0.06	June 29	
				0.16	July 12	
				0.26	July 18	
				0.54	July 28	
				0.42	Aug. 12	2.24
1919	June 5	June 19	15			0.00
	July 9	July 27	19			0.00
	Aug. 25	Sept. 20	27	0.20	Sept. 8	0.20
1920	Sept. 24	Oct. 23	30	0.06	Oct. 16	0.06
1921	May 13	June 9	28	0.06	June 5	0.06
1922	July 27	Aug. 12	17			0.00
	Oct. 11	Oct. 31	21			0.00
1923	Sept. 9	Oct. 15	37	0.06	Sept. 20	
				0.01	Oct. 5	0.07
1924	Sept. 23	Nov. 7	46	0.02	Oct. 6	
				0.06	Nov. 1	0.08
1925	Apr. 6	May 9	34	0.01	Apr. 14	
				0.04	Apr. 28	0.05
	May 15	June 6	23	0.04	May 24	
				0.04	June 1	
				0.01	June 3	0.09
	Aug. 23	Sept. 23	32	0.10	Sept. 12	
				0.20	Sept. 13	0.30
1926	June 28	July 31	34	0.02	July 8	
				0.01	July 25	
				0.10	July 26	
				0.48	July 27	0.61
1927	Oct. 13	Nov. 1	20			0.00
1928	June 26	July 12	17			0.00
	Sept. 3	Oct. 15	43	0.02	Oct. 3	
				0.14	Oct. 4	
				0.18	Oct. 5	0.34
1929	Aug. 14	Sept. 5	23			0.00
1930	May 20	Aug. 30	103	0.06	June 6	
				0.33	July 1	
				0.42	July 20	
				0.06	July 21	
				0.53	July 24	
				0.50	Aug. 5	
				0.03	Aug. 14	
				0.08	Aug. 16	
				0.02	Aug. 17	2.03

Little Rock

1879	Aug. 25	Nov. 7	75	0.39	Sept. 12	
				0.05	Oct. 1	
				0.03	Oct. 2	
				0.01	Oct. 3	
				0.31	Oct. 11	
				0.58	Oct. 17	
				0.03	Nov. 5	1.40
1880	Apr. 30	May 19	20			0.00
1881	July 1	July 18	18			0.00
	July 28	Aug. 28	32	0.01	Aug. 15	0.01
	Sept. 2	Sept. 27	26	0.05	Sept. 10	0.05
1882	No drought.					
1883	Aug. 24	Sept. 14	22			0.00
1884	Sept. 30	Oct. 20	21			0.00
1885	No drought.					
1886	Aug. 7	Aug. 27	21	0.01	Aug. 11	
				0.03	Aug. 25	0.04
1887	July 8	Nov. 22	138	0.06	July 21	
				0.09	July 29	
				0.06	Aug. 2	
				0.02	Aug. 3	
				0.12	Aug. 5	
				0.12	Aug. 15	
				0.12	Aug. 17	
				0.14	Aug. 22	
				0.12	Aug. 25	
				0.48	Aug. 26	
				0.48	Sept. 15	
				0.01	Sept. 17	
				0.06	Sept. 22	

TABLE I—Continued

Little Rock—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1887	July 8	Nov. 22		0.25	Sept. 26	
				0.23	Sept. 27	
				0.01	Sept. 29	
				0.02	Oct. 10	
				0.27	Oct. 22	
				0.55	Oct. 23	
				0.12	Oct. 24	
				0.01	Oct. 26	3.34
1888	Sept. 2	Sept. 20	19	0.02	Sept. 6	0.02
1889	Aug. 16	Aug. 30	15			0.00
	Sept. 30	Oct. 28	29	0.12	Oct. 13	0.12
	Nov. 28	Dec. 30	33	0.02	Dec. 9	
				0.02	Dec. 10	
				0.06	Dec. 20	0.10
1890	No drought.					
1891	Sept. 4	Oct. 2	29	0.04	Sept. 16	0.04
	Oct. 5	Nov. 1	28	0.14	Oct. 14	0.14
1892	Sept. 13	Oct. 13	31	0.04	Oct. 8	0.04
1893	No drought.					
1894	May 31	July 1	32	0.02	June 5	
				0.03	June 6	
				0.02	June 10	
				0.19	June 20	0.26
	Nov. 3	Nov. 22	20			0.00
1895	Sept. 2	Oct. 6	35	0.05	Sept. 21	
				0.04	Sept. 23	
				0.16	Sept. 26	
				0.01	Oct. 4	0.26
1896	June 6	June 20	15			0.00
	July 16	Aug. 18	34	0.01	Aug. 9	
				0.06	Aug. 11	
				0.11	Aug. 16	0.18
1897	June 28	July 16	19	0.03	July 10	0.03
	Aug. 11	Oct. 27	78	0.11	Aug. 30	
				0.33	Sept. 13	
				0.28	Oct. 10	
				0.24	Oct. 11	
				0.01	Oct. 20	0.97
1898	June 22	July 24	33	0.02	June 28	
				0.01	July 7	
				0.11	July 8	
				0.01	July 17	
				0.02	July 21	0.17
1899	July 31	Aug. 25	26	0.03	Aug. 4	
				0.09	Aug. 14	0.12
	Sept. 19	Oct. 16	28	0.09	Oct. 10	
				0.08	Oct. 11	
				0.01	Oct. 12	0.18
1900	May 9	May 26	18	0.01	May 16	0.01
1901	Apr. 26	May 10	15			0.00
	June 9	July 4	26			0.00
1901	Dec. 15	Jan. 3	20			0.00
1902						
	July 1	July 25	25			0.00
	Aug. 12	Aug. 31	20			0.00
1903	No drought.					
1904	Aug. 27	Sept. 18	23	0.16	Sept. 3	
				0.01	Sept. 4	0.17
	Oct. 12	Nov. 1	21			0.00
1905	No drought.					
1906	May 7	May 25	19	0.02	May 24	0.02
	Oct. 18	Nov. 6	20			0.00
1907	July 12	July 27	16			0.00
	Sept. 10	Oct. 3	24			0.00
	Oct. 8	Oct. 29	22	0.01	Oct. 26	0.01
1908	Aug. 24	Sept. 19	27	0.16	Sept. 4	
				0.04	Sept. 6	0.20
	Sept. 28	Oct. 22	25	0.09	Oct. 17	0.09
1909	Aug. 13	Sept. 3	22	0.02	Aug. 24	0.02
1910	Jan. 21	Feb. 15	26	0.03	Feb. 2	
				0.04	Feb. 11	0.07
	Sept. 7	Sept. 26	20			0.00
	Oct. 28	Dec. 21	55	0.01	Nov. 1	
				0.04	Nov. 15	
				0.04	Nov. 16	
				0.03	Dec. 5	
				0.04	Dec. 12	0.16
1911	May 1	May 19	19			0.00
	May 22	June 16	26			0.00
1912	Aug. 27	Sept. 14	19			0.00
	Nov. 7	Nov. 30	24	0.01	Nov. 27	0.01
1913	Dec. 29	Jan. 22	25	0.05	Jan. 18	0.05
1914						
	May 13	June 30	49	0.01	May 16	
				0.01	June 15	0.02
	Oct. 21	Nov. 25	36	0.08	Nov. 8	0.08
1915	July 9	July 31	23	0.03	July 19	0.03
	Aug. 30	Sept. 19	21			0.00
	Oct. 19	Nov. 7	20			0.00
1916	Mar. 2	Mar. 24	23	0.03	Mar. 14	0.03
	May 4	June 4	32	0.12	May 21	
				0.32	May 29	0.44
	June 30	July 31	32	0.12	July 3	
				0.05	July 6	
				0.01	July 7	
				0.15	July 12	
				0.05	July 21	
				0.06	July 28	0.44
1917	May 4	May 20	17			0.00
	June 9	July 6	28	0.11	June 23	
				0.05	June 28	
				0.01	July 2	0.17

TABLE I—Continued

Little Rock—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1917	Sept. 4	Oct. 17	44	0.08	Sept. 15	
				0.09	Sept. 16	
				0.01	Sept. 17	
				0.04	Sept. 27	
				0.14	Oct. 8	0.36
1918	No drought					
1919	July 11	July 27	17			0.00
	Aug. 26	Sept. 20	26	0.01	Sept. 7	0.01
1920	Sept. 24	Oct. 14	21			0.00
1921	May 12	June 5	25			0.00
	Oct. 3	Nov. 8	37	0.01	Oct. 28	
				0.07	Oct. 31	0.08
1922	Aug. 17	Nov. 4	80	0.69	Sept. 10	
				0.11	Sept. 15	
				0.12	Sept. 16	
				0.01	Sept. 19	
				0.13	Oct. 6	
				0.04	Oct. 7	
				0.55	Oct. 16	
				0.05	Oct. 23	
				0.17	Nov. 1	1.87
1923	June 21	July 13	23	0.05	June 28	
				0.01	July 9	0.06
	Sept. 20	Oct. 15	26			0.00
1924	Sept. 28	Nov. 6	40	0.06	Oct. 31	0.06
1925	May 14	June 7	25			0.00
	Aug. 22	Sept. 10	20			0.00
1926	May 12	June 14	34	0.01	May 19	
				0.07	May 30	
				0.01	May 31	
				0.19	June 3	0.28
1927	June 22	July 13	22	0.07	June 30	0.07
	Sept. 4	Sept. 25	22			0.00
1928	Sept. 16	Oct. 2	17			0.00
1929	Sept. 14	Oct. 2	19			0.00
1930	Mar. 25	May 1	38	0.03	Apr. 5	
				0.06	Apr. 23	
				0.06	Apr. 26	
				0.02	Apr. 27	0.17
	May 24	Sept. 7	107	0.02	May 29	
				0.08	June 4	
				0.04	June 30	
				0.01	July 1	
				0.08	Aug. 4	
				0.19	Aug. 16	
				0.13	Aug. 17	
				0.03	Aug. 18	
				0.13	Aug. 30	
				0.09	Aug. 31	0.80

Mena

[Dallas, 1897–1905, inclusive; Mena, 1906–1930, inclusive]

1897	June 28	July 16	19			0.00
	Aug. 19	Sept. 8	21			0.00
	Sept. 17	Oct. 10	24			0.00
1898	Oct. 20	Nov. 8	20			0.00
1899	June 17	July 3	17			0.00
	Aug. 22	Sept. 16	26			0.00
	Sept. 18	Oct. 9	22			0.00
	Oct. 28	Nov. 17	21			0.00
1900	July 31	Aug. 20	21	0.10	Aug. 11	0.10
1901	Oct. 9	Nov. 1	24	0.02	Oct. 11	0.02
1901	Dec. 18	Jan. 17	31	0.10	Jan. 4	0.10
1902						
	May 31	June 16	17			0.00
	July 1	July 23	23	0.05	July 19	0.05
	Aug. 12	Aug. 31	20			0.00
	Oct. 4	Oct. 25	22			0.00
1903	Oct. 14	Dec. 11	59	0.08	Nov. 10	
				0.08	Dec. 1	
				0.12	Dec. 4	
				0.02	Dec. 8	0.30
1904	No drought					
1905	Do.					
1906	Oct. 18	Nov. 16	30	0.01	Nov. 17	0.01
1907	July 14	July 28	15			0.00
	Aug. 6	Aug. 20	15			0.00
	Sept. 10	Oct. 1	22	0.05	Sept. 18	0.05
	Oct. 9	Oct. 28	20			0.00
1908	Aug. 24	Sept. 11	19			0.00
	Sept. 28	Nov. 1	35	0.11	Oct. 20	0.11
	Dec. 1	Dec. 27	27	0.09	Dec. 6	0.09
1909	June 30	July 14	15			0.00
	July 19	Aug. 5	18			0.00
	Sept. 10	Oct. 7	28	0.15	Sept. 21	0.15
1910	Apr. 16[1]	May 5	20			0.00
	June 5[1]	June 24	20			0.00
	July 13[1]	July 29	17			0.00
	Sept. 7	Sept. 26	20			0.00
	Oct. 28	Dec. 21	55	0.11	Nov. 15	
				0.21	Nov. 16	
				0.04	Nov. 26	
				0.02	Dec. 6	
				0.16	Dec. 12	
				0.12	Dec. 13	0.66

[1] For Center Point.

TABLE I—Continued

Mena—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1911	May 31	June 17	18			0.00
1912	Jan. 19	Feb. 15	28			0.00
	May 29	June 12	15			0.00
	Aug. 23	Sept. 14	23			0.00
	Nov. 7	Nov. 30	24			0.00
1913	June 10	June 29	20			0.00
	Aug. 2	Sept. 7	37			0.00
1913	Dec. 26	Jan. 28	34	0.08	Jan. 25	0.08
1914						
1915	Aug. 28	Sept. 15	19			0.00
	Oct. 19	Nov. 7	20			0.00
1916	Mar. 4	Mar. 23	20			0.00
	Aug. 7	Aug. 31	25	0.03	Aug. 14	
				0.06	Aug. 23	0.09
	Oct. 20	Nov. 13	25			0.00
1917	Sept. 28	Oct. 17	20			0.00
1917	Dec. 9	Jan. 5	28			0.00
1918						
	Mar. 5	Apr. 2	29	0.06	Mar. 30	
				0.02	Mar. 31	0.08
	July 13	Aug. 6	25	0.01	July 18	
				0.12	July 28	0.13
1919	July 4	July 24	21	0.02	July 22	0.02
	Aug. 1	Aug. 15	15			0.00
1920	No drought.					
1921	Oct. 4	Oct. 28	25	0.01	Oct. 26	0.01
1922	Sept. 12	Oct. 5	24			0.00
1923	Aug. 1	Sept. 1	32			0.00
1924	Sept. 28	Nov. 6	40	0.15	Oct. 31	0.15
1925	Aug. 22	Sept. 11	21	0.02	Sept. 9	0.02
1926	Jan. 23	Feb. 16	25	0.02	Feb. 14	0.02
1927	June 22	July 14	23			0.00
	Aug. 10	Aug. 26	17	0.01	Aug. 18	0.01
	Sept. 9	Sept. 27	19			0.00
1928	Aug. 29	Oct. 6	39	0.07	Sept. 1	
				0.03	Oct. 5	0.10
1929	July 8	Sept. 4	59	0.01	Aug. 1	
				0.22	Aug. 9	
				0.04	Aug. 13	0.27
	Sept. 14	Oct. 2	19			0.00
	June 7	June 23	17			0.00
1930	June 26	Sept. 8	75	0.18	July 9	
				0.23	Aug. 1	
				0.02	Aug. 5	0.43

Newport

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
1897	May 13	May 28	16			0.00
	Aug. 20	Oct. 30	72	0.21	Oct. 10	
				0.35	Oct. 11	
				0.10	Oct. 20	
				0.08	Oct. 28	0.74
1898	May 22	June 7	17			0.00
1899	Sept. 19	Oct. 9	21			0.00
1900	July 30	Aug. 22	24	0.25	Aug. 18	0.25
	Nov. 26	Dec. 18	23			0.00
1901	Apr. 19	May 11	23	0.04	Apr. 25	0.04
	June 17	Aug. 15	60	0.29	July 5	
				0.22	July 6	
				0.20	July 22	
				0.04	July 25	
				0.18	July 30	
				0.17	July 31	
				0.12	Aug. 11	1.22
	Aug. 25	Sept. 11	18			0.00
	Sept. 18	Oct. 7	20			0.00
1901						
1902	Dec. 18	Jan. 17	31			0.00
	July 1	July 19	19			0.00
1903	June 6	June 20	15			0.00
	Aug. 17	Sept. 10	25			0.00
1904	Oct. 7	Dec. 4	59	0.02	Oct. 11	
				0.10	Nov. 3	
				0.08	Nov. 4	
				0.12	Nov. 10	
				0.30	Nov. 21	
				0.06	Dec. 2	0.68
1905	No drought.					
1906	Oct. 19	Nov. 10	23			0.00
1907	July 13	July 28	16			0.00
	Sept. 11	Sept. 27	17			0.00
1908	Sept. 20	Nov. 9	42	0.45	Oct. 24	
				0.25	Nov. 3	0.70
1908	Dec. 1	Jan. 4	35	0.35	Dec. 29	0.35
1909						
	June 18	Sept. 4	79	0.01	June 21	
				0.86	July 9	
				0.30	July 23	
				0.05	Aug. 11	
				0.02	Aug. 16	
				0.01	Aug. 19	1.25
	Sept. 24	Oct. 31	38	0.03	Oct. 9	
				0.02	Oct. 10	
				0.03	Oct. 17	
				0.37	Oct. 20	
				0.38	Oct. 21	0.83

TABLE I—Continued

Newport—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1910	Jan. 19	Feb. 15	28	0.02	Feb. 3	0.02
	Mar. 11	Mar. 30	20			0.00
	July 14	Aug. 3	21			0.00
	Sept. 10	Sept. 24	15			0.00
	Oct. 22	Dec. 3	43	0.15	Nov. 5	
				0.20	Nov. 16	
				0.06	Nov. 27	
				0.04	Nov. 28	0.45
1911	May 2	May 20	19			0.00
	May 22	June 16	26			0.00
1912	May 17	June 13	28	0.06	June 2	0.06
	Aug. 28	Sept. 15	19			0.00
	Nov. 7	Dec. 4	28	0.10	Dec. 2	0.10
1913	May 23	June 6	15			0.00
	Aug. 19	Sept. 4	17			0.00
1914	May 7	July 1	56	0.01	May 12	
				0.01	May 28	
				0.37	June 2	
				0.01	June 13	
				0.01	June 16	
				0.04	June 17	0.45
1915	Aug. 28	Sept. 28	32			0.00
	Oct. 18	Nov. 7	21			0.00
1916	May 4	May 18	15			0.00
	June 24	July 19	26			0.00
	Aug. 15	Sept. 1	18			0.00
	Sept. 23	Oct. 18	26			0.00
	Oct. 20	Nov. 8	20			0.00
1917	May 5	May 21	17			0.00
	July 27	Aug. 20	25	0.20	Aug. 16	0.20
	Sept. 21	Oct. 25	35	0.10	Oct. 18	
				0.10	Oct. 19	0.20
	Oct. 31	Dec. 7	38	0.30	Nov. 28	
				0.05	Nov. 29	0.35
1918	Jan. 29	Feb. 28	31	0.15	Feb. 19	0.15
	Mar. 1	Apr. 3	34	0.07	Mar. 24	0.07
	June 7	July 17	41	0.10	June 26	
				0.15	June 29	
				0.20	June 30	
				0.10	July 11	0.55
	July 25	Aug. 18	25			0.00
1919	Dec. 14	Jan. 6	24			0.00
1920						
1921	Jan. 15	Feb. 4	21			0.00
	May 12	June 8	28			0.00
	Oct. 9	Oct. 28	20			0.00
1922	June 14	June 28	15			0.00
	July 26	Oct. 5	72	0.28	Aug. 17	
				0.39	Aug. 27	
				0.08	Aug. 31	
				0.15	Sept. 1	
				0.80	Sept. 11	
				0.50	Sept. 20	2.20
1923	No drought.					
1924	Sept. 23	Nov. 11	50	0.08	Oct. 31	0.08
1925	May 15	May 30	16			0.00
	Aug. 22	Sept. 11	21			0.00
1925	Dec. 6	Jan. 2	28	0.10	Dec. 14	
1926				0.03	Dec. 23	0.13
	July 10	July 24	15			0.00
1927	June 22	July 14	23			0.00
	Sept. 5	Sept. 26	22	0.01	Sept. 19	0.01
	Oct. 13	Nov. 1	20			0.00
1928	July 29	Aug. 13	16			0.00
	Sept. 16	Oct. 1	16			0.00
1929	Aug. 13	Sept. 4	23			0.00
1930	June 17	Aug. 10	55	0.01	July 1	
				0.34	July 25	
				0.01	Aug. 1	
				0.05	Aug. 5	0.41

Pocahontas

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
1897	June 20	July 17	28	0.04	July 10	
				0.04	July 15	0.08
	Aug. 18	Oct. 26	70	0.61	Oct. 10	
				0.06	Oct. 11	0.67
1898	No drought.					
1899	Sept. 19	Oct. 9	21			0.00
1900	July 29	Aug. 21	24			0.00
1901	Apr. 18	Aug. 10	115	0.42	May 16	
				0.25	May 17	
				0.03	May 19	
				0.17	June 6	
				0.03	June 13	
				0.06	June 15	
				0.09	July 4	
				0.47	July 5	
				0.16	July 6	
				0.05	July 16	
				0.09	July 30	
				0.10	July 31	
				0.21	Aug. 4	2.13
	Aug. 28	Sept. 13	17			0.00

TABLE I—Continued

Pocahontas—Continued

Year	Beginning—	Ending—	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1901	Dec. 19	Jan. 19	32			0.00
1902	July 1	July 18	18			0.00
	Oct. 5	Oct. 25	21			0.00
1903	Jan. 3	Jan. 22	20			0.00
	June 5	June 20	16			0.00
	Aug. 16	Sept. 9	25			0.00
1904	Oct. 6	Dec. 2	58			0.00
1905	No drought.					
1906	Oct. 19	Nov. 7	20			0.00
1907	Sept. 16	Oct. 2	17			0.00
1908	June 14	June 28	15			0.00
	Aug. 23	Sept. 19	28	0.08	Sept. 4	0.08
	Sept. 28	Oct. 23	26			0.00
	Dec. 7	Dec. 28	22			0.00
1909	Aug. 8	Sept. 4	28	0.02	Aug. 16	0.02
1910	Mar. 11	Apr. 2	23			0.00
	Sept. 7	Sept. 23	17			0.00
	Nov. 6	Nov. 26	21			0.00
1911	No drought.					
1912	Aug. 19	Sept. 16	29			0.00
	Sept. 26	Oct. 17	22			0.00
	Nov. 7	Dec. 22	46	0.11	Dec. 1	0.11
1913	Apr. 27	May 14	18			0.00
1914	Jan. 3	Jan. 23	21			0.00
	May 7	July 1	56	0.70	June 11	
				0.05	June 15	
				0.35	June 20	1.10
1915	May 29	June 12	15			0.00
	Aug. 30	Sept. 17	19			0.00
	Oct. 18	Nov. 7	21			0.00
1916	June 24	July 19	26	0.23	July 12	0.23
	Aug. 3	Aug. 31	29	0.05	Aug. 16	0.05
	Oct. 20	Nov. 8	20			0.00
1917	June 10	July 1	22			0.00
	Aug. 30	Oct. 25	57	0.05	Sept. 8	
				0.30	Sept. 20	
				0.10	Sept. 27	
				0.07	Oct. 3	
				0.18	Oct. 8	
				0.10	Oct. 19	0.80
1918	June 7	June 28	22	0.16	June 25	0.16
	July 11	Aug. 14	35	0.15	July 23	
				0.25	Aug. 8	0.40
1919	Aug. 27	Sept. 17	22			0.00
1919	Dec. 14	Jan. 5	23			0.00
1920	June 4	June 18	15			0.01
1921	May 12	June 7	27			0.01
1922	No drought.					
1923	Do.					
1924	Oct. 6	Nov. 10	36	0.10	Oct. 31	0.10
1925	No drought.					
1926	June 11	July 6	26	0.05	June 22	
				0.08	June 25	0.13
1927	June 22	July 13	22			0.00
	Aug. 19	Sept. 25	38			0.00
1928	Sept. 1	Oct. 1	31	0.08	Sept. 15	0.08
1929	Aug. 13	Sept. 4	23			0.00
1930	June 16	July 22	37	0.05	July 7	0.05

Rogers

1897	Aug. 19	Oct. 9	52	0.04	Aug. 30	
				0.25	Sept. 10	
				0.05	Sept. 14	
				0.16	Sept. 16	0.50
1898	Jan. 23	Mar. 9	46	0.45	Feb. 19	0.45
	June 28	July 19	22	0.03	July 4	0.03
	Sept. 22	Oct. 9	18			0.00
1898	Dec. 20	Jan. 29	41	0.05	Jan. 6	0.05
1899	Aug. 25	Oct. 15	52	0.85	Sept. 17	
				0.02	Oct. 10	0.87
1900	July 25	Aug. 22	29			0.00
1901	May 19	June 5	18	0.02	May 30	0.02
	June 20	July 12	23			0.00
1901	Dec. 18	Jan. 18	32	0.02	Jan. 4	0.02
1902						
1902	Dec. 21	Jan. 19	30	0.02	Jan. 4	
1903				0.03	Jan. 7	0.05
	Nov. 5	Nov. 30	26	0.02	Nov. 24	0.02
1903	Dec. 25	Jan. 19	26			0.00
1904						
1904	Oct. 5	Jan. 8	96	0.34	Oct. 24	
1905				0.02	Nov. 3	
				0.03	Nov. 9	
				0.04	Nov. 10	
				0.04	Dec. 9	
				0.06	Dec. 17	
				0.60	Dec. 23	
				0.04	Dec. 26	
				0.20	Dec. 27	1.37

TABLE I—Continued

Rogers—Continued

Year	Beginning—	Ending	Number of days	Precipitation	Date	Total
				Inches		*Inches*
1906	May 6	May 30	25			0.00
	Oct. 16	Nov. 15	31	0.03	Oct. 23	
				0.03	Nov. 11	0.06
1907	Jan. 31	Feb. 22	23			0.00
	June 28	Aug. 3	37	0.37	July 11	
				0.06	July 15	
				0.30	July 27	0.73
	Oct. 8	Oct. 31	24			0.00
1908	Dec. 7	Dec. 28	22			0.00
1909	July 27	Oct. 7	73	0.04	Aug. 8	
				0.02	Aug. 13	
				0.02	Aug. 14	
				0.02	Aug. 20	
				0.08	Aug. 29	
				0.10	Sept. 13	
				0.26	Sept. 14	
				0.03	Sept. 21	0.53
1910	Jan. 19	Feb. 15	28	0.02	Feb. 2	
				0.05	Feb. 9	0.07
1910	Oct. 28	Feb. 10	106	0.16	Nov. 5	
1911				0.02	Nov. 26	
				0.03	Dec. 4	
				0.02	Dec. 5	
				0.01	Dec. 6	
				0.32	Dec. 28	
				0.42	Dec. 29	
				0.72	Jan. 28	1.70
	June 1	June 21	21	0.79	June 18	0.09
	Aug. 6	Aug. 21	16			0.00
1912	Jan. 19	Feb. 8	21			0.00
	July 1	Aug. 6	37	0.05	July 11	
				0.02	July 16	
				0.34	July 30	
				0.17	Aug. 2	0.58
	Aug. 22	Sept. 16	26	0.28	Sept. 10	0.28
1912	Nov. 7	Jan. 4	59	0.02	Dec. 1	
1913				0.03	Dec. 23	0.05
	July 28	Sept. 7	42	0.14	Aug. 22	0.14
1913	Dec. 26	Jan. 24	30			0.00
1914						
	Nov. 9	Nov. 30	22	0.03	Nov. 28	0.03
1915	Aug. 24	Sept. 15	23			0.00
	Oct. 18	Nov. 7	21			0.00
1916	July 17	Aug. 30	45	0.09	July 31	
				0.48	Aug. 3	
				0.05	Aug. 16	
				0.08	Aug. 27	0.70
1917	Jan. 16	Feb. 13	29			0.00
	May 5	May 19	15			0.00
	Sept. 28	Nov. 16	50	0.02	Oct. 25	
				0.48	Oct. 29	0.50
1917	Dec. 10	Jan. 4	26			0.00
1918						
	June 13	June 28	16			0.00
	July 30	Aug. 13	15			0.00
1919	Aug. 30	Sept. 17	19	0.03	Sept. 15	0.03
1919	Dec. 10	Jan. 6	28			0.00
1920						
	Sept. 24	Oct. 14	21			0.00
	Nov. 2	Nov. 29	28	0.06	Nov. 8	
				0.03	Nov. 26	0.09
1921	July 15	Aug. 2	19	0.02	July 26	0.02
1922	Sept. 11	Oct. 31	51	0.16	Oct. 7	
				0.38	Oct. 15	
				0.12	Oct. 16	0.66
1923	June 29	July 14	16			0.00
	July 31	Aug. 21	22	0.05	Aug. 14	0.05
1923	Dec. 23	Jan. 14	23			0.00
1924						
	May 1	May 19	19	0.09	May 15	0.09
	Sept. 3	Sept. 17	15			0.00
	Oct. 10	Oct. 30	21			0.00
1925	Feb. 24	Apr. 2	38	0.09	Mar. 13	
				0.19	Mar. 26	0.28
	Aug. 21	Sept. 9	20			0.00
1925	Nov. 27	Jan. 1	36	0.03	Dec. 3	
1926				0.05	Dec. 4	
				0.03	Dec. 13	
				0.02	Dec. 14	0.13
1927	June 21	July 12	22			0.00
	Aug. 30	Sept. 23	25	0.16	Aug. 13	
				0.02	Aug. 18	0.18
1928	Sept. 11	Oct. 4	24			0.00
1929	July 8	Sept. 4	59	0.06	July 18	
				0.40	Aug. 8	
				0.10	Aug. 19	
				0.02	Aug. 21	
				0.34	Aug. 24	0.92
	Sept. 13	Oct. 3	21	0.02	Sept. 20	0.02
1930	July 9	Aug. 3	26			0.00
	Aug. 18	Sept. 5	19	0.02	Aug. 31	0.02

TABLE II.—*Dry periods in 33 years by months for 12 stations*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
15 to 19 days	0	0	0	5	51	45	29	41	33	0	0	0	204
20 to 29 days	25	12	14	8	29	34	36	60	55	59	16	26	365
30 to 39 days	4	2	7	1	6	10	13	27	13	18	4	16	121
40 to 49 days	3	0	0	2	5	4	7	8	13	5	3	2	52
50 to 59 days	0	1	1	1	5	3	6	6	8	7	1	0	39
60 to 69 days	0	0	0	0	3	3	2	3	1	1	3	0	16
70 to 79 days	0	0	0	0	1	4	7	5	1	2	0	0	20
80 to 89 days	0	0	0	0	1	2	3	5	1	0	0	0	12
90 to 99 days	0	0	0	0	1	0	0	2	0	2	0	0	5
100 or more days	0	0	0	2	3	1	0	2	0	2	0	0	10
Total 12 stations, 33 years	32	15	22	19	96	106	103	159	125	96	27	44	844
Average number of periods per station per month and per year	0.08	0.04	0.06	0.05	0.24	0.27	0.26	0.40	0.32	0.24	0.07	0.11	2.13

TABLE III.—*Dry periods at stations in 33 years*

	15 to 19 days	20 to 29 days	30 to 39 days	40 to 49 days	50 to 59 days	60 to 69 days	70 to 79 days	80 to 89 days	90 to 99 days	100 or more days	Greatest number of days	Date began	Amount of precipitation
Arkansas City	28	33	12	7	4	1	4	2	1	1	105	Aug. 12, 1903	2.22
Camden	22	29	10	3	3	0	2	1	0	0	87	Aug. 2, 1929	2.21
Calico Rock	21	25	11	5	3	5	2	2	1	0	91	May 13, 1914	2.00
Dardanelle	22	35	17	9	3	1	2	0	0	2	125	Aug. 16, 1897	2.35
											103	Apr. 19, 1901	3.38
Fort Smith	8	25	16	3	5	4	1	2	1	1	112	Oct. 12, 1910	1.52
Fulton	23	33	9	8	3	2	1	1	1	2	126	June 8, 1897	3.11
											109	May 24, 1930	1.69
Helena	10	29	10	5	1	2	1	3	0	1	103	May 20, 1930	2.03
Little Rock	11	33	7	3	1	0	1	1	0	1	107	May 24, 1930	0.80
Mena	17	36	7	1	3	0	1	0	0	0	75	June 26, 1930	0.43
Newport	20	29	8	3	4	1	3	0	0	0	79	June 18, 1909	1.25
Pocahontas	10	28	6	1	3	0	1	0	0	1	115	Apr. 18, 1901	2.13
Rogers	12	30	8	4	6	0	1	0	1	1	106	Oct. 28, 1910	1.70
Total, 33 years	204	365	121	52	39	16	20	12	5	10			
Average number of periods per station per year	0.52	0.92	0.32	0.13	0.10	0.04	0.05	0.03	0.01	0.03			
Little Rock											138	July 8, 1887	3.34

TABLE IV.—*Number of dry periods in 33 years with 15 days or more, 20 days or more, etc.*

	15 days or more	20 days or more	30 days or more	40 days or more	50 days or more	60 days or more	70 days or more	80 days or more	90 days or more	100 days or more
Arkansas City	93	65	32	20	13	9	8	4	2	1
Camden	70	48	19	9	6	3	3	1	0	0
Calico Rock	75	54	29	18	13	10	5	3	1	0
Dardanelle	91	69	34	17	8	5	4	2	2	2
Fort Smith	66	58	33	17	14	9	5	4	2	1
Fulton	83	60	27	18	10	7	5	4	3	2
Helena	62	52	23	13	8	7	5	4	1	1
Little Rock	58	47	14	7	4	3	3	2	1	1
Mena	65	48	12	5	4	1	1	0	0	0
Newport	68	48	19	11	8	4	3	0	0	0
Pocahontas	50	40	12	6	5	2	2	1	1	1
Rogers	63	51	21	13	9	3	3	2	2	1
Total, 33 years	844	640	275	154	102	63	47	27	15	10
Average per station per year	2.13	1.62	0.69	0.39	0.26	0.16	0.12	0.07	0.04	0.025
Number of years per one occurrence	0.47	0.62	1.40	2.56	3.85	6.25	8.33	14.29	25.00	40.00

DYNAMICAL PRESSURE EFFECT ON THE FRIEZ-TYPE AEROMETEOROGRAPH

By LOUIS P. HARRISON

[Weather Bureau, Washington, D.C., June 1933]

As is well known, the motion of air relative to an exposed object in general produces an excess of pressure over the static (or barometric) pressure on its windward side and a deficiency of pressure on its leeward side. The pressure which is recorded by an aerometeorograph mounted on a moving airplane is, therefore, subject to at least two influences which cause it to differ from the static pressure of the air at the same level. First, the motion of the airplane relative to the air produces a considerable deficiency of pressure for some distance above the wings and an excess of pressure for some distance below the wings. Second, the stream of air blowing past the aerometeorograph produces dynamical pressure effects such as are described in the first sentence, the reference pressure being what the pressure would be at the location of the aerometeorograph if the latter were absent.

The first source of error may be partially overcome by mounting the instrument on a biplane at some location between the wings where the effects of the upper and lower wings neutralize each other. In general, this position has been estimated to be somewhat nearer to the upper wing than to the lower, perhaps about two thirds of the way up, and perhaps two thirds of a chord length back of the leading edge of the upper wing. A difficulty is that the best location changes with change in angle of attack, etc. In the case of monoplanes, the instrument should be mounted as far below the wing as practicable and perhaps one half to two thirds of a chord length back from the leading edge. In any case, other disturbing elements, such as struts, etc., should be avoided as far as possible.

If the instrument is mounted in a place where the effect of the wings, struts, etc., can be considered negligible, the second source of error can be corrected for by the use of data obtained from wind-tunnel measurements and readings of the indicated air speed of the airplane. Such data for a Friez-type aerometeorograph (see figs. 1 and 2) have been obtained at the Aerodynamic Laboratory of the United States Bureau of Standards.

In the observations to this end, the instrument was mounted at the center of a wind tunnel. To determine the dynamic effect, two small copper tubes were introduced into the instrument with the open ends near the sylphon pressure element, one at the side of the element pointing vertically upward, the other at the top of the element pointing horizontally. These tubes were connected through valves to one side of an inclined manometer of approximately 5 to 1 slope containing benzol. The other side of the manometer was connected to a small hole in the wall of the wind tunnel within which the air was at the static pressure of the tunnel. By this arrangement, small pressure differences could be accurately measured. Each tube could be connected in turn to the manometer. No significant difference was observed between the readings of the two tubes, and the average values were used.

The observations showed that the dynamic pressure effect caused the instrument to read too low, and that this deficiency of pressure, Δp, was proportional to the velocity pressure $\frac{1}{2}\rho v^2$, where ρ = density of the air, and v = velocity of the air. Thus, with the instrument in the normal flying position (0° yaw) and over a range of speeds from 30 to 95 miles per hour in the tunnel the

(To face page p. 140)

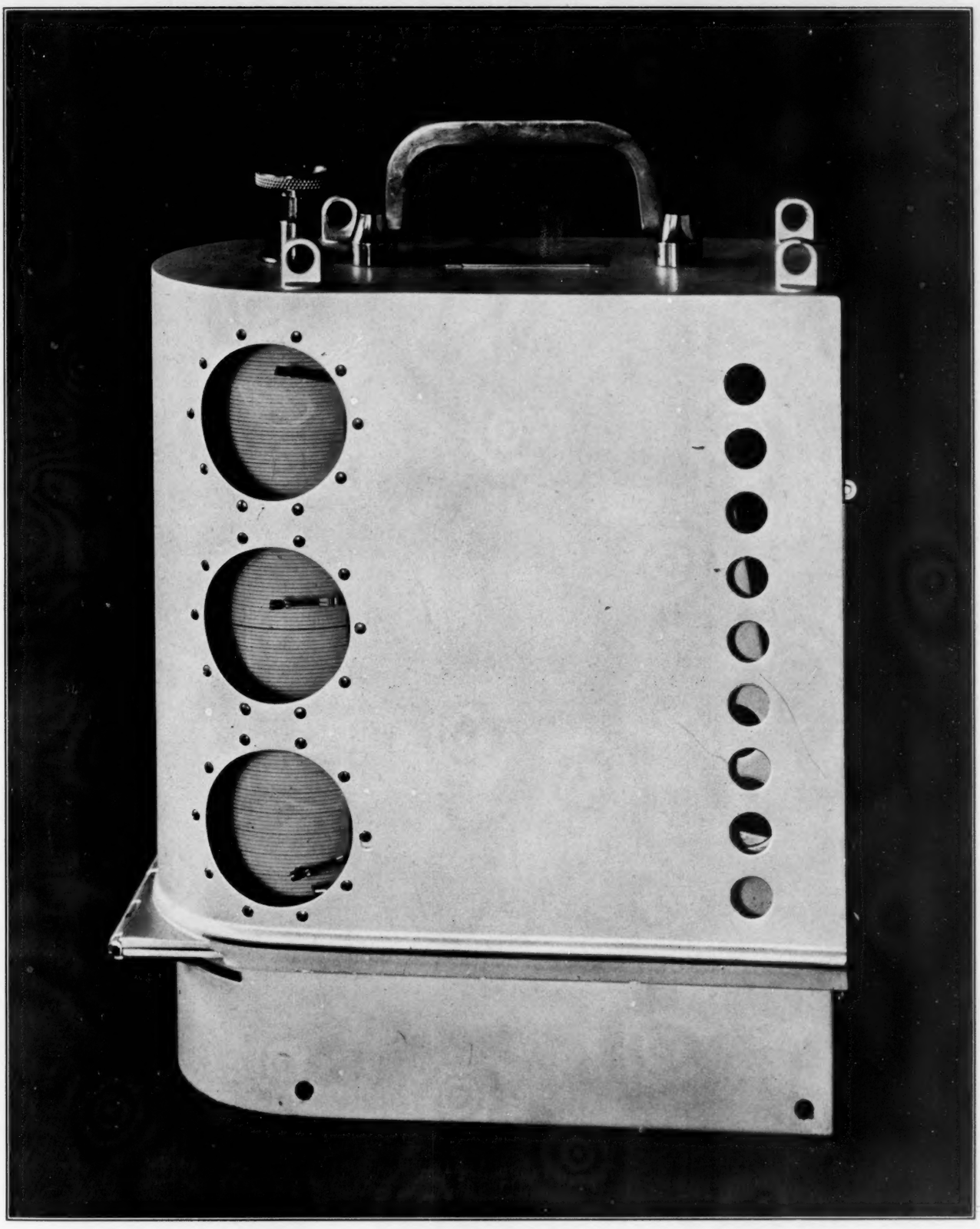

FIGURE 1.—Side view of the Friez type Aerometeorograph with cover closed. The leading edge is on the left; the ventilation holes are on the right. Length from leading edge to rear = 8¾ inches, width = 4 inches, height = 10 inches, approximately.

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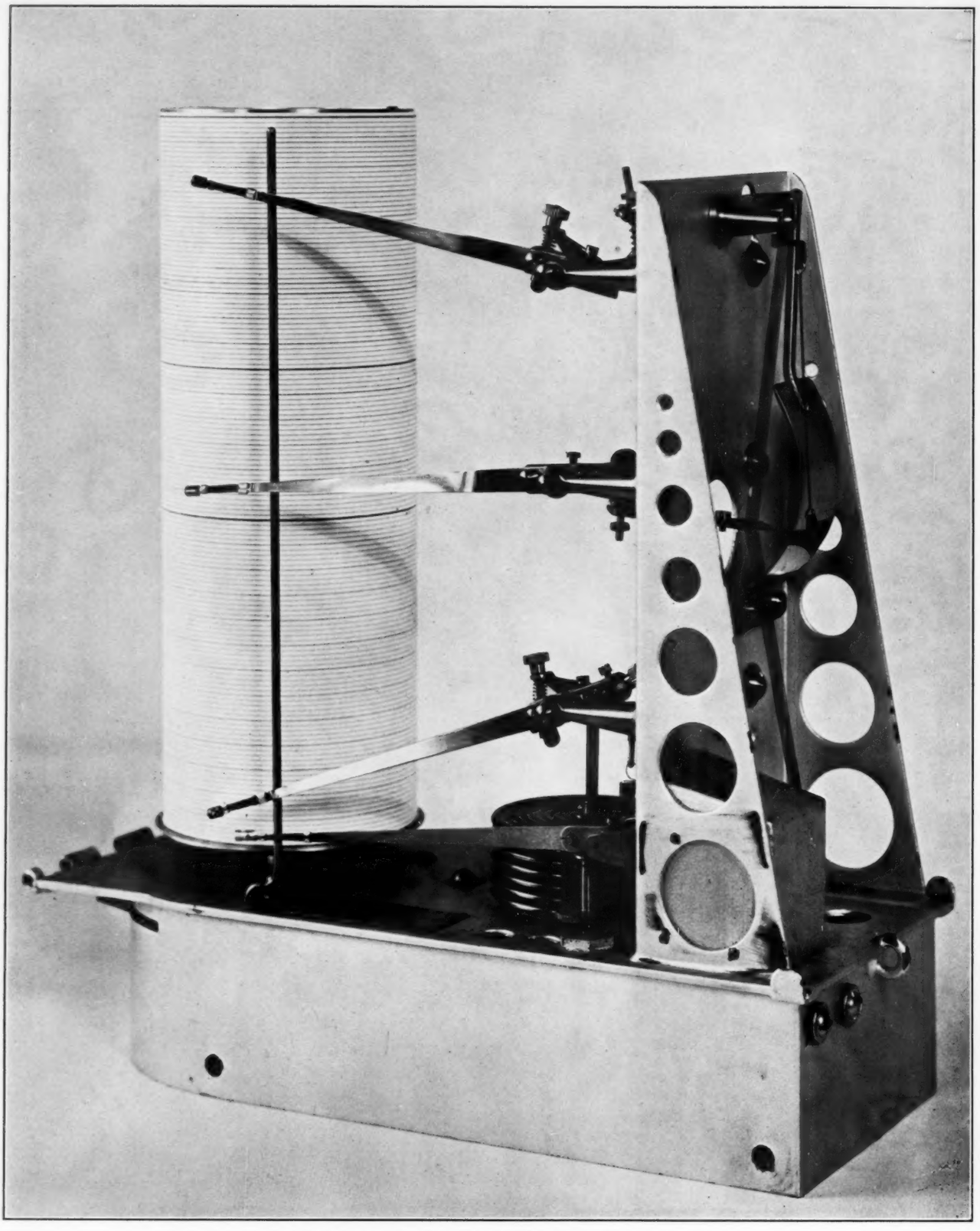

FIGURE 2.—View of Aerometeorograph with cover removed.

ratio $\Delta p/\frac{1}{2}\rho v^2$ was found to average 0.207, with individual values showing a maximum variation of 7 percent and a mean variation of 3 percent from the average.

Measurements were made at angles of yaw up to 60° with the results given in the table below, the application of which is obvious from the basic relation:

$\Delta p = kv_s^2$, where

Δp = dynamic pressure deficiency in *mm of mercury*.

v_s = "standard" (or indicated) airspeed, in *miles per hour* (referred to standard density of 0.07651 lbs./ft.^{3}).

k = constant for a given angle of yaw.

TABLE 1

Angle of yaw	k
0°	0.000190
5°	.000204
10°	.000242
15°	.000267
20°	.000353
25°	.000386
30°	.000399
45°	.000435
60°	.000407

From this it is easy to compute, for example, that at 5° yaw the absolute pressure given by the instrument at an indicated air speed of 100 miles per hour is 2 mm lower than the true static pressure.

Several attempts were made to reduce the error in question. The most promising result was secured by the use of flaps or scoops over the side holes to increase the pressure in the space at the rear of the instrument. The flaps were made by cementing flat strips of metal about ¾ inch wide and about 7¾ inches long, bent at an angle of approximately 45°, behind the side ventilation holes. At 0° angle of yaw, with the flaps, k was found to be 0.000017, and at 15°, k was 0.000094. With this arrangement, the effect is less than 0.3 mm at 100 miles per hour for small angles of yaw.

The use of flaps greatly increases the ventilation of the temperature and humidity elements, whence the question arises as to the possible effect of the strong air currents on the indications of these elements. Tests made to determine this effect were inconclusive because of the vibration of the tunnel and the slow speed of the drum. However, the effect was not very large and possibly may be avoided by the use of baffle plates to direct the air currents within the instrument.

Acknowledgement is made to Dr. H. L. Dryden and his associates of the Bureau of Standards for their kind cooperation and for making the wind tunnel measurements and experiments as well as the necessary calculations.

LITERATURE

(1) P. RAETHJEN und ED. HUSS.
"Über Vergleichbarkeit aerologischer Druck- und Temperaturmessungen beim augenblicklichen Entwicklungsstand des Instrumentariums und der Aufstiegsmethoden"
Beiträge zur Physik der freien Atmosphäre, Band XVIII, Heft 3, pp. 171–179, 1932.

(2) P. DUCKERT und W. KOPP.
"Lässt der heutige Stand der Instrumententechnik aerologisch einwandfreie Flugzeugmessungen zu oder nicht?"
Ibid, Band XVIII, Heft 4, pp. 253–262, 1932.

(3) P. RAETHJEN und ED. HUSS.
"Nachtrag zu der Arbeit: 'Über Vergleichbarkeit Aerologischer Druck- und Temperaturmessungen beim augenblicklichen Entwicklungsstand des Instrumentariums und der Aufstiegmethoden'"
Ibid, Band XX, Heft 1, pp. 47–50, 1932.

ANALYSIS OF THE PRECIPITATION OF RAINS AND SNOWS AT MOUNT VERNON, IOWA

By S. FRANCIS WILLIAMS and O. KENNETH BEDDOW

[Cornell College, Mount Vernon, Iowa, June 1932]

Under the direction of Dr. Nicholas Knight, Cornell College, Mount Vernon, Iowa, has for the last 24 years carried on an analysis of the rain and snow precipitated here. The results of much of this work have been published in periodicals of a scientific nature.

The precipitations are collected in clean granite pans, away from trees and buildings, and stored in glass stoppered bottles. The town has no factories and, exclusive of the college, has a population of about 1,700. The sulphuric acid found, therefore, comes mainly from the coal used in private heating plants. It is worthy of note this year there has been a lack of sulphuric acid. We have never found so little sulphuric acid in the rains as we found the past winter. This may be due to the depression. The coal burned in heating plants contains sulphur which in burning becomes sulphuric acid in the atmosphere. The poor people burned wood which was furnished them, or by cutting it, they could obtain their fuel very cheaply. One of the local coal dealers claims he has sold no coal to the people living in the country. Hence the depression affected the atmosphere and consequently the precipitations.

It has been found necessary to deduct 3.55 parts per million from the reading to allow for the formation of the color in the test for the chlorides. Six drops of the potassium dichromate indicator were used. Due to some criticism special care has been taken in the analysis of the chlorides, which, after considerable work, we have reason to believe correct. The phenoldisulphonic acid method was used with the nitrates. All of the samples were colorless.

The method used in the analysis are taken from the Standard Methods of Water Analysis, sixth edition, published by the American Health Association.

The results of the school year 1931–32 are expressed in tables 1 and 2. The numbers indicate the parts of the various substances in a million parts of water. We examined 48 samples of rains and snows.

TABLE 1.—*Parts per million*

No.	Date	Amount	Precipitation	Nitrates	Nitrites	Free NH_3	Alb. NH_3	Sol	Cl
1	June 12	0.1	Rain			0.08	0.04		7.15
2	Sept. 19	1.2	do	0.03	.002	.112	.04		7.15
3	Sept. 22	1.9	do	.01	Traces	.08	.056		3.6
4	Sept. 23	.5	do	1.00	.014	.08	.056		3.6
5	Sept. 25	2.25	do	.02	.032	.112	.04		3.6
6	Oct. 4	.2	do	.01	.01	.24	.056		3.6
7	Oct. 6	.25	do	.01	.032	.24	.08		3.6
8	Oct. 7	.3	do	.01	.002	.32	.16		3.6
9	Oct. 10	2.5	do	.01	.002	.32	.04		10.7
10	Oct. 14	.5	do	.01	.024	.16	.08		3.6
11	Oct. 23	1.1	do	.01	.04	.16	.16		3.6
12	Oct. 27	.55	do	Traces	.036	.32	.04		10.7
13	Oct. 31	.3	do	Traces	.04	.112	.112		10.7
14	Nov. 10	.1	do	.02	.036				10.7
15	Nov. 12	1.	do	.036		.04	.08		10.65
16	Nov. 15	1.	do	.04	.5	.056	.28	0.044	3.6
17	Nov. 17	1.25	do	.21		.056	.16		3.6
18	Nov. 20	.5	do	.03	.5	.08	.04		10.65
19	Nov. 23	1.5	do	.036	.25	.056	.04		7.15
20	Nov. 27	.25	do	.036	.5	.08	.056		7.15
21	Dec. 9	4.	Snow	.36	Traces	.2	.136	.428	3.6
22	Dec. 11	.3	Rain	.12	.05	.08	.056	.324	3.6
23	Dec. 14	1.	Snow	.01		.16	.24	.146	10.7
24	Dec. 31	1.15	Rain	.01	.05	.08	.04	.168	7.
25	Jan. 6	.5	do	.01	.025	.24	.136	.134	7.
26	Jan. 13	.25	do	.24	.05	.32	.2	.184	7.
27	Jan. 15	.3	Rain and snow	.1	.05	.112	.056	.068	7.
28	Jan. 16	.25	Rain	.08	.05	.116	.056	1.68	7.
29	Jan. 26	2.	Rain and snow	.12	.5	.16	.2	1.7	7.
30	Feb. 16	.25	Rain	.01	.05	.08	.04		10.7
31	Mar. 2	.6	do	.030	Traces	.056	.112		10.7
32	Mar. 5	.6	Snow	.02	.05	.16	.056		7.15
33	Mar. 19	.4	Rain and snow	.01	.05	.32	.2		10.7
34	Mar. 21	.9	Snow	.01	.05	.16	.056		10.7
35	Mar. 26	.15	Rain	.01		.16	.056		3.6
36	Mar. 31	.08	do	.03	.03				17.5
37	Apr. 7	.08	do	.07	.01	.136	.056		10.7
38	Apr. 16	.35	do	.02	.05	.2	.32	Traces	3.6
39	Apr. 19	.4	do	.02	.05	.056	.112	Traces	7.2
40	Apr. 20	.15	do	.03	.05	.32	.2	Traces	7.15
41	Apr. 24	.4	do	.01	.04	.32	.36	Traces	7.15
42	Apr. 30	.2	do	.01	Traces	.08	.04		10.7
43	May 3	.7	do	.01	Traces	.114	.056		10.7
44	May 7	.7	do	Traces	Traces	.24	.136		15.25
45	May 16	.5	do	.01	Traces	.16	.056		3.6
46	June 3	1.05	do	.01	.03	.112	.2		7.2
47	June 4	.3	do	.01	.01	.32	.04		3.6
48	June 8	.3	do	.01	.05	.2	.136		3.6

TABLE 2.—*Data from table 1 converted to pounds per acre*

[1 inch of rain over 1 acre=226,875 pounds]

No. of sample	Nitrates	Nitrites	Free NH_3	Alb. NH_3	Sulphur	Chlorides
1			0.001815	0.000907		0.162215
2	0.00816	0.00054	.030492	.01089		1.9464
3	.004310		.034485	.024139		1.551825
4	.113437	.001381	.009075	.006352		.408375
5	.010209	.016350	.057172	.020418		2.53768
6	.000453	.000453	.010890	.002541		1.6335
7	.000567	.001814	.013612	.004537		.204184
8	.000680	.000136	.021780	.010890		.245025
9	.005671	.001134	.118499	.022687		6.06890
10	.001343	.002722	.018150	.009075		.408375
11	.002495	.009982	.039920	.039920		.888416
12		.004492	.039920	.004991		1.335159
13		.002722	.007623	.007623		.728268
14	.004530	.000816				.242756
15	.068468		.009075	.018150		2.416218
16	.009075	.133437	.012705	.063525	.01108	.816750
17	.059554		.015881	.045374		1.020934
18	.003403	.056718	.009074	.004537		1.208064
19	.012251	.085078	.019057	.013612		2.433000
20	.020418	.028359	.004537	.003176		.405500
21	.026952		.014973	.010182	.03204	.269524
22	.008167	.003403	.005444	.003811	.02205	.245023
23	.000181		.002904	.004356	.02649	.194205
24	.002609	.013045	.020872	.010436	.04383	1.82364
25	.001134	.002835	.027224	.015427	.01520	.794059
26	.013684	.002850	.018245	.011403	.010491	.399126
27	.006806	.003403	.007622	.038114	.004628	.476434
28	.004537	.002835	.006579	.003176	.095386	.397026
29	.063350	.226875	.072600	.907500	.771375	.247625
30	.000567	.002935	.004537	.002268		.606852
31	.004083		.007623	.015246		1.456537
32	.000226	.000567	.001814	.000635		.081102
33	.000907	.004537	.029040	.018150		.971025
34	.000158	.000794	.002540	.000889		.169986
35	.000340		.005444	.001905		.122511
36	.005445	.005445				.317625
37	.001270	.000181	.002464	.001016		.194205
38	.001588	.003970	.015881	.025409		.286861
39	.001815	.004537	.005082	.010164		.653400
40	.001020	.001701	.010889	.006806		.243321
41	.000907	.003630	.029040	.032670		.648863
42	.000453		.003627	.001814		.485311
43	.001588		.018104	.008893		1.699288
44			.037114	.021589		2.421883
45	.001134		.018149	.006352		.408373
46	.002382	.007146	.026680	.047643		1.714169
47	.000680	.000680	.021780	.002722		.245023
48	.000680	.003403	.013612	.009256		.245023

PLAN FOR DIRECT CALL TO SHIPS BY RADIO FOR WEATHER REPORTS DURING HURRICANE SEASON

[Bulletin issued by the Forecast Division, Weather Bureau, Washington, June 1, 1933]

When a tropical disturbance is in progress in the southern portion of the North Atlantic, the Gulf of Mexico, or the Caribbean Sea, ship reports of weather conditions by radio are frequently lacking from the areas in which the disturbance is located, even though some ships may be traversing the area. The present program provides weather reports twice daily throughout the hurricane season from a number of ships known to traverse the hurricane districts more or less regularly. This list of ships is now about as extensive as available appropriations will permit for daily service. Prefixed arrangements with other ships for securing additional or special observations when a storm is known to be in progress are not practicable; nevertheless, some additional observations are secured during such conditions by adding to weather bulletins broadcast for the benefit of ships a request for special reports from any ship within a specified area and by general notices included in navigation publications asking masters to radio weather reports on their own initiative, when a tropical disturbance is encountered or known to exist in the vicinity. Direct acknowledgment by letter is made to shipmasters who forward special observations.

During the coming hurricane season the arrangements described in the foregoing will be supplemented by publication of appeals in the Hydrographic Bulletin and other publications of the United States Hydrographic Office.

Notwithstanding the foregoing arrangements, it is known that in past instances, when reports were badly needed, ships, (principally those making occasional visits to ports in the hurricane area, and those not on regularly scheduled routes, with which it was impracticable to make prior arrangements for daily reports) were in the vicinity of a disturbance but sent no reports.

In order to assure the receipt of the maximum number of reports, a new and supplemental plan will be inaugurated at the beginning of the 1933 hurricane season. This additional program provides for direct calls for observations by radiogram to ships in certain zones in which a tropical storm is known or suspected to exist. Certain shore radio stations which are capable of communicating with vessels in the respective zones will be utilized as the medium through which the radiograms will be transmitted.

The Radiomarine Corporation of America has offered cooperation and will make its radio stations available. The locations, call signals, and ranges of the radio stations of that company, which will participate in the program, and the contacting weather stations, are as follows:

Radio station	Call signals	Range		Weather Bureau office
		Day	Night	
Palm Beach, Fla	WOE	600	1,800	Miami.
Tampa, Fla	WPD	400	1,000	Tampa.
Port Arthur, Tex	WPA	600	1,600	Port Arthur.
Galveston, Tex	WGV	300	900	Galveston.

For several years the South Puerto Rico Sugar Co., through its radio station at Ensenada (call letters WPR) has been cooperating with the Weather Bureau by sending general calls out to ships for weather reports when a hurricane had been reported or when there were indications of a tropical storm, and by relaying weather reports from ships which could not communicate directly with main land stations. This service has been of inestimable value to forecasters of the Weather Bureau at San Juan and Washington in the issuing of hurricane warnings and advices. The South Puerto Rico Sugar Co. will continue this cooperation and participate in the program by making direct calls for reports from ships in designated zones.

When reports are needed from any zone or from more than one zone, a message will be sent to the appropriate local Weather Bureau official, stating the zones and the times for which observations are desired. The official in charge of the Weather Bureau office will immediately advise the radio operator. The radio operator will then send messages direct to ships in the zone from which reports are desired, requesting that weather observations taken at specified hours be forwarded by radio to the Weather Bureau office at Washington.

As an added effort to provide the best possible service to the people, and to the business and shipping interests, it is planned to provide Weather Bureau officials in charge of stations on the South Atlantic and Gulf coasts with weather reports from ships whenever a hurricane is in progress and there is any probability of the sections in which the stations are located being affected by the storm. Such reports, in addition to the land station observations and the advisory and warning messages issued from Washington, will be helpful to local Weather Bureau officials in giving service.

BIBLIOGRAPHY

C. FITZHUGH TALMAN, in Charge of Library

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

Aimes, A.
Météoropathologie. Paris. 1932. 219 p. 23 cm.

Champly, René.
Les moteurs à vent; théorie, construction, montage, utilisation au puisage de l'eau et à la production de l'électricité. Paris. 1933. vii, 270 p. illus. diagrs. 25½ cm.

Ekhart, E.
Ein interessanter Nebeleinbruch. p. 481–487. figs. pl. 26 cm. (Sonderdr.: Der Bergsteiger, Nr. 8, Mai 1933.)

Eredia, Filippo.
Le condizioni meteorologiche generali sulla aviolinea Milano-Roma. Roma. 1933. 19 p. figs. 25 cm. (Estr.: Rivista aeron., Anno 9, N. 1. Genn. 1933-XI.)
Disposizioni per i sondaggi notturni con palloni piloti. Roma. 1933. 8 p. figs. 24½ cm. (Estr.: Rivista aeronautica. Anno 8, N. 12. Dic. 1932-X.)
Lo scirocco in Italia. Roma. 1933. 22 p. figs. 32 cm. (Annali Uff. presagi. v. 5, 1932-XI.)

Johansson, Osc. V.
Die Beaufortskala in einfachen Formeln und Gedächtnisregeln. Helsingfors. 1933. 26 p. 24 cm. (Mitt. met. Inst. Univ. Helsingfors. N:0 23.)

Kadel, B. C.
Airport weather station. Do you know how to equip one for your port? p. 50–51. illus. 30 cm. (Airports. Washington, N.J. v. 4, Apr., 1930.)

Kidson, E.
Wairarapa floods of August, 1932. Wellington. 1933. p. 220–227. figs. 25½ cm. (Met'l office note no. 13.) (Extr.: New Zealand journ. sci. & tech., v. 14, no. 4, 1933.)

Kinoshita, M., & Uchiyama, K.
On the size of fog droplets. Tokyo. 1932. p. 144–147. figs. 26½ cm. (Sci. papers Inst. phys. & chem. res. no. 391. v. 19, 1932.)

Millas, José Carlos.
Memoria del huracán de Camagüey de 1932. Habana. 1933. 64 p. figs. 23½ cm.

National research council. Committee on hydrodynamics.
Report of the committee on hydrodynamics . . . Washington. 1932. 634 p. diagrs. 25 cm. (Bulletin Nat. research council. no. 84, Feb., 1932.)

Nunn, Roscoe.
Are you on chummy terms with the weather man? p. 5–6. 29 cm. (Southern florist. April 21, 1933.)

Sanson, Joseph.
L'Atmosphère et l'agriculture. Paris. 1932. 146 p. illus. maps. diagrs. 19 cm.

Schonland, Basil F. J.
Atmospheric electricity. London. [1932.] vii, 100 p. illus. diagrs. 17½ cm.

Theaman, John R.
Extreme weather records. [Indianapolis.] 1932. 44 p. 16 cm. (Extracts from gov't met'l pubs. Dec., 1932.)

Vanière, Joseph F.
Dictionary of aeronautical terms in abridged form, German-English-French; French-English-German. New York. [c1929.] 141 p. 20½ cm.

SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING MAY 1933

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1932, REVIEW, page 26.

Table 1 shows that solar radiation intensities averaged above normal for May at all three stations at which normal incident measurements are made.

Table 2 shows a deficiency in the total solar radiation received on a horizontal surface at Madison, Lincoln, La Jolla, Gainesville and Miami, and an excess at all other stations.

May was unusually cloudy throughout the United States and particularly so along the Atlantic Seaboard. Hence but few turbidity measurements were possible at Washington, and those obtained on May 18, the best day of the month, indicate that even then the sky was rather turbulent.

Polarization observations obtained at Washington on 2 days give a mean of 55 percent with a maximum of 56 percent on the 18th. At Madison, observations obtained on 4 days give a mean of 59 percent with a maximum of 70 percent on the 3d. These values are close to the May normals for the respective stations.

TABLE 1.—*Solar radiation intensities during May 1933*

[Gram-calories per minute per square centimeter of normal surface]

Washington, D.C.

Date	Sun's zenith distance: 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A.M.					P.M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
May 4	6.50					1.52					5.79
May 18	8.48	0.59	0.74	0.91	1.07	1.29					6.76
May 27	17.37			.82							18.59
May 29	14.60				0.97	1.29					14.10
Means		(.59)	(.74)	(.86)	(1.02)	1.37					
Departures		−.04	+.03	+.04	+.03	+.08					
Madison, Wis.											
May 3	4.37			1.19	1.35	1.49					4.95
May 4	4.37				1.20						5.56
May 16	9.47					1.48					8.81
May 17	10.21					1.34					11.38
May 19	13.13					1.52					12.24
May 25	8.48				1.07						7.04
May 31	10.59				1.02	1.39					10.59
Means				(1.19)	1.16	1.44					
Departures				+.16	+.05	+.08					

TABLE 1.—*Solar radiation intensities during May 1933*—Continued

Lincoln, Nebr.

Date	Sun's zenith distance: 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A.M.					P.M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm*
May 14	7.09		.84	.99	1.19	1.40					6.27
May 18	14.60			.79	1.01	1.32					14.60
May 19	16.20								0.65	0.50	15.11
May 23	9.47						1.10	0.81	.65		7.87
May 24	7.29					1.40	1.07	.84			5.56
May 26	8.18			1.01	1.16	1.44					8.18
May 27	9.14			1.03	1.21	1.48					9.47
May 31	9.14			1.03	1.20	1.38	1.15	.93	.80		9.83
Means			(.84)	.97	1.15	1.40	1.08	.86	.70	(.50)	
Departures			+.05	+.04	+.03	+.02	−0.02	−.04	−.12	−.21	
Blue Hill, Mass.											
May 2	11.8					1.39	1.20				11.8
May 4	4.6				1.41	1.49	1.17				4.7
May 5	2.6				1.34	1.53					3.2
May 7	4.6					1.45					4.0
May 12	8.5				1.10	1.23	.77				8.5
May 15	3.4					1.44	1.24				5.0
May 16	4.6					1.41	1.17				5.2
May 17	4.2					1.42	1.10				5.1
May 18	5.4				1.18	1.42	1.07				6.3
May 19	8.2				1.15	1.32	.94				8.4
May 22	9.5					1.42	1.17				6.8
Means					1.24	1.41	1.09				

[1] Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Gainesville	Miami	New Orleans
	Gram calories per square centimeter												
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
April 30	418	295	233	277	415	644	150	262	464	424	450	505	330
May 7	263	244	319	345	316	522	207	405	373	424	530	499	422
May 14	520	512	711	446	487	698	359	401	550	474	528	442	482
May 21	576	492	598	419	481	682	448	525	685	426	621	572	464
May 28	519	570	638	529	362	676	521	412	607	313	565	525	580
	Departures from weekly normals												
April 30	−40	−149	−243	−86	+37	+63	−5		+54	+12	−134	−29	
May 7	−173	−201	−133	−29	−54	−86	+20		+196	±0	−68	−51	
May 14	+54	+40	+182	+51	+102	+63	+12		+68	+35	−77	−104	
May 21	+74	+5	+40	−4	+73	+17	−35		−47	−28	+31	+50	
May 28	+3	+76	+123	+98	−54	+6	+10		+9	−135	+22	+17	
	Accumulated departures on June 3												
	+3,850	+5,187	−406	+3,773	+3,570	+3,703	+665		+1,710	−4,641	−9,576	−2,464	

TABLE 3.—*Solar radiation measurements, and determinations of atmospheric turbidity factor, β, Washington, D.C., May 1933*

[Values in italics have been interpolated]

Date and solar hour angle	Solar altitude, h.	Air mass, m.	I_m	I_y	I_r	β	Blueness of sky	Atmospheric dust particles per cubic centimeter	Notes: (sky-light polarization, P.) clouds, etc.
May 18			*gr. cal.*	*gr. cal.*	*gr. cal.*				
5:43a	15–29	3.70	0.776	0.593	*0.510*	0.090		727	
5:39a	16–05	3.58	.812	*.596*	.514	.080			
5:26a	18–34	3.12	.888	*.664*	.539	.070			
5:20a	19–44	2.95	.914	*.667*	*.543*	.068			
5:01a	23–26	2.51	.990	.706	*.570*	.070			
4:57 a	24–12	2.43	.997	*.711*	.573	.072			
3:51 a	37–04	1.65	1.141	*.813*	.648	.105	5		P=56.4%
3:44 a	38–22	1.61	1.139	.818	*.651*	.115			

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Perkins, and Mount Wilson observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1933	h. m.	°	°	°			
May 1 (Naval Observatory)	11 0	No spots					
May 2 (Naval Observatory)	10 38	No spots					
May 3 (Mount Wilson)	9 30	No spots					
May 5 (Naval Observatory)	10 29	No spots					
May 6 (Mount Wilson)	9 30	No spots					
May 7 (Naval Observatory)	13 29	No spots					
May 9 (Mount Wilson)	9 17	−22.0	158.4	−6.0	6		6
May 12 (Mount Wilson)	11 5	+8.0	147.6	−13.0	4		4
May 13 (Naval Observatory)	13 8	No spots					
May 14 (Naval Observatory)	11 11	No spots					
May 15 (Mount Wilson)	13 0	No spots					
May 16 (Naval Observatory)	14 7	No spots					
May 17 (Naval Observatory)	14 39	No spots					
May 18 (Naval Observatory)	11 34	+12.0	72.0	+7.0	12		12
May 19 (Naval Observatory)	10 38	+22.0	69.3	+12.0	25		25

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1933	h. m.	°	°	°			
May 20 (Naval Observatory)	12 23	+36.0	69.1	+12.0		46	46
May 21 (Naval Observatory)	10 34	+49.0	69.9	+12.0		46	46
May 22 (Naval Observatory)	11 13	+63.0	70.3	+12.0		93	93
May 23 (Naval Observatory)	11 26	−26.0	327.9	+9.0		28	
		+76.0	69.9	+12.0		93	121
May 24 (Naval Observatory)	10 19	−15.0	326.3	+10.0		12	12
May 26 (Mount Wilson)	12 30	+40.0	353.6	+11.0	6		6
May 27 (Naval Observatory)	10 20	No spots					
May 28 (Naval Observatory)	11 35	No spots					
May 29 (Naval Observatory)	13 56	No spots					
May 31 (Mount Wilson)	9 28	No spots					
Mean daily area for May							15

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR MAY 1933

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

May 1933	Relative numbers	May 1933	Relative numbers	May 1933	Relative numbers
1	0	11	0	21	12
2	8	12	0	22	11
3	0	13	0	23	17
4	0	14	0	24	12
5	0	15	0	25	8
6	0	16	0	26	0
7	0	17		27	
8	0	18	0	28	0
9	8	19	8	29	
10	8	20	12	30	0
				31	0

Mean: 28 days=3.7.

AEROLOGICAL OBSERVATIONS

[Aerological Division, W. R. Gregg, in charge]

By L. T. SAMUELS

Free-air temperatures during May were considerably above normal at the stations shown in table I, except at Norfolk where they were close to normal. Notwithstanding the positive temperature departures, those of relative humidity were likewise positive at most stations.

In most cases the free-air resultant wind velocities for the month exceeded the normals, except in the upper Mississippi Valley and Upper Lakes region where they were below normal. Resultant wind directions were, in general, close to normal, except in the southern section where a preponderance of southerly winds occurred.

Upper-air observations were discontinued on April 30, 1933, at Ellendale incident to closing the station on June 30. Hence all the data given in table I are based on airplane observations.

TABLE 1.—*Free-air temperatures and relative humidities obtained by airplanes during May 1933*

Altitude (meters) m.s.l.	Atlanta, Ga. (303 meters)[1]		Boston, Mass. (6 meters)[2]		Chicago, Ill. (187 meters)[3]		Cleveland, Ohio (246 meters)[3]		Dallas, Tex. (146 meters)[4]		Norfolk, Va. (3 meters)[3]		Omaha, Nebr. (300 meters)[5]		Pensacola, Fla. (2 meters)[5]		San Diego, Calif. (9 meters)[5]		Washington, D.C. (2 meters)[6]	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	18.3	(7)	15.4	(7)	13.6	(7)	13.8	(7)	20.1	(7)	18.2	−0.4	12.3	(7)	24.1	+1.4	16.4	−1.7	16.4	−1.4
500	19.8	(7)	11.8	(7)	13.8	(7)	14.9	(7)	20.9	(7)	17.1	−0.7	12.8	(7)	22.7	+1.9	12.2	−2.0	16.3	+0.7
1,000	19.6	+4.8	9.2	+1.2	12.4	+2.1	13.0	+2.7	19.6	+3.0	16.0	+0.1	12.4	+0.4	20.6	+2.4	11.5	−2.3	15.8	+2.3
1,500	16.7	+5.0	6.6	+1.7	10.5	+3.0	10.6	+3.1	18.0	+3.3			10.8	+1.6						
2,000	13.3	+4.5	4.8	+2.6	8.0	+3.0	7.8	+2.8	15.5	+3.2	10.8	+0.6	8.9	+2.3	15.5	+2.6	8.8	−2.2	10.8	+2.3
2,500	10.1	+4.1	2.5	+2.8	5.2	+2.6	5.0	+2.4	12.8	+3.2			6.2	+2.3						
3,000	7.4	+4.4	−0.4	+2.5	2.6	+2.6	2.4	+2.4	10.2	+3.6	5.5	+1.1	2.9	+1.9	10.5	+2.8	4.8	−0.8	5.4	+2.4
4,000	0.4	+3.5	−5.9	-----	−3.6	+2.1	−3.4	+2.3	3.9	+3.5			−4.1	+0.7	4.9	+2.9	−1.5	−0.9	0.5	+3.2
5,000	−6.9	+3.1	−11.4	-----	−9.7	+2.0	−9.2	+2.5	−2.8	+2.5			−10.9	−0.2	−2.5	+2.9				
RELATIVE HUMIDITY (PERCENT)																				
Surface	85	(7)	63	(7)	87	(7)	81	(7)	85	(7)	75	+5	83	(7)	82	+2	69	0	78	+12
500	76	(7)	63	(7)	80	(7)	71	(7)	73	(7)	70	+9	78	(7)	78	+4	75	−1	69	+8
1,000	65	+1	61	−10	73	+9	68	+4	67	−2	61	+6	70	+8	71	+5	66	+4	65	+7
1,500	62	−2	60	−15	69	+7	70	+8	55	−3			65	+3						
2,000	60	−2	56	−20	64	+6	68	+10	51	+2	58	+6	57	−3	58	+5	43	+4	65	+7
2,500	57	−2	52	−19	60	+8	66	+14	45	0			52	−6						
3,000	47	−8	53	−12	53	+5	63	+15	41	−4	52	+1	48	−10	43	+1	31	+3	59	+5
4,000	41	−11	46	-----	50	+5	61	+16	35	−11	-----	-----	45	−14	23	0	26	+3	47	−2
5,000	38	−12	45	-----	45	+1	50	+6	33	−20	-----	-----	42	−20	18	0	-----	-----	-----	-----

Weather Bureau observations made near 5 a.m.; Navy observations near 7 a.m. (75th meridian time).

[1] Temperature and humidity departures based on normals of Due West, S.C.
[2] Airplane observations made by Massachusetts Institute of Technology; departures based on normals obtained from kite observations made at Blue Hill Meteorological Observatory.
[3] Temperatures and humidity departures based on normals of Royal Center, Ind.
[4] Temperature departures based on normals determined by intrepolating between those of Groesbeck, Tex., and Broken Arrow, Okla. Humidity departures based on normals of Groesbeck, Tex.
[5] Naval air stations.
[6] Temperature and humidity departures based on normals of Drexel, Nebr.
[7] Surface and 500-meter level departures omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 7 a.m. (E.S.T.) during May 1933*

[Wind from N=360°; E=90°, etc.]

Altitude (meters) m.s.l.	Albuquerque, N. Mex. (1,554 meters)		Atlanta, Ga. (309 meters)		Bismarck, N.Dak. (518 meters)		Brownsville, Tex. (12 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Chicago, Ill. (192 meters)		Cleveland, Ohio (245 meters)		Dallas, Tex. (154 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	308	1.6	227	0.5	22	0.5	139	2.7	191	2.3	287	4.4	160	0.2	181	1.6	156	2.9	223	1.1	225	0.5	119	3.4
500	-----	-----	227	2.2	-----	-----	159	8.9	216	3.7	-----	-----	218	3.3	218	3.6	176	7.2	-----	-----	209	3.7	121	7.0
1,000	-----	-----	242	4.4	209	1.3	159	8.5	268	4.9	-----	-----	257	3.2	252	4.6	201	7.5	250	2.3	197	2.9	122	5.9
1,500	-----	-----	253	5.4	199	1.0	161	6.4	293	6.7	-----	-----	260	5.0	255	5.8	214	4.4	312	3.6	189	2.4	122	4.9
2,000	266	2.4	248	6.2	164	1.1	150	4.8	291	7.8	277	5.4	254	5.0	259	6.5	248	4.1	279	2.4	231	2.1	121	4.1
2,500	258	4.0	247	5.6	303	1.4	103	1.6	301	9.5	269	6.5	260	4.5	258	6.8	300	4.9	272	3.4	241	2.4	113	3.6
3,000	258	5.5	255	5.2	272	3.2	55	1.4	303	9.9	282	6.6	300	4.3	269	7.5	312	5.5	261	5.1	230	2.7	103	2.3
4,000	261	10.2	270	4.3	267	3.6	38	1.7	302	12.9	276	7.4	-----	-----	264	7.1	336	5.2	272	7.6	240	1.4	331	4.8
5,000	268	10.8	287	3.5	-----	-----	-----	-----	-----	-----	264	8.7	-----	-----	276	7.7	-----	-----	237	5.3	298	3.0	309	8.4

Altitude (meters) m.s.l.	Los Angeles, Calif. (217 meters)		Medford, Oreg. (410 meters)		Memphis, Tenn. (83 meters)		New Orleans, La. (1 meter)		Oakland, Calif. (8 meters)		Oklahoma City, Okla. (402 meters)		Omaha, Nebr. (306 meters)		Phoenix, Ariz. (338 meters)		Salt Lake City, Utah (1,294 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	41	0.8	294	0.4	176	1.5	121	1.0	254	1.0	169	2.2	93	1.0	301	0.1	154	2.3	80	1.6	130	1.9	331	0.5
500	39	1.0	311	0.7	204	5.6	156	3.7	295	4.2	185	4.1	255	0.8	264	2.4	-----	-----	87	3.9	202	5.1	279	3.7
1,000	353	3.7	300	0.8	227	6.7	170	3.4	311	6.4	212	8.2	252	5.0	276	3.9	-----	-----	108	1.3	199	5.4	284	4.7
1,500	312	3.1	211	1.8	225	6.2	155	1.9	301	6.0	238	7.6	257	7.4	282	4.6	165	2.6	291	1.9	204	4.8	275	5.0
2,000	310	4.4	236	4.2	233	6.1	178	2.4	303	5.6	246	7.7	273	8.3	268	4.6	187	2.6	297	3.3	221	5.1	279	5.5
2,500	310	6.3	249	5.7	264	7.0	204	2.2	304	7.2	258	8.5	285	9.0	251	5.4	208	1.5	311	4.8	231	6.0	287	6.5
3,000	303	7.2	252	6.1	272	7.1	256	2.4	300	7.5	263	7.4	281	9.1	250	5.9	254	2.7	316	4.8	220	6.8	277	8.7
4,000	288	7.3	248	8.8	243	1.9	298	4.7	299	11.8	274	6.2	297	9.3	239	9.3	230	4.0	291	7.8	-----	-----	273	8.8
5,000	-----	-----	-----	-----	-----	-----	-----	-----	268	5.4	-----	-----	-----	-----	259	8.4	-----	-----	288	10.8	-----	-----	279	11.2

RIVERS AND FLOODS

By MONTROSE W. HAYES

[In charge River and Flood Division]

During May 1933 minor floods occurred in Michigan, in the Santee and Savannah Rivers on the Atlantic slope, in the West Pearl and Bogue Chitto Rivers in the east Gulf of Mexico drainage, in the Trinity River in Texas, and in the Colorado River system. In addition, moderate to severe floods occurred in the Maumee River in Indiana, in the rivers of the upper Mississippi, Ohio, White, Arkansas, and Lower Mississippi Basins and in the Columbia River on the Pacific slope. Some of these floods were continuations of the floods of the preceeding months and information on all of them is not complete. A discussion of the floods of March, April, and May will appear in a later issue of the REVIEW.

THE WEATHER OF THE ATLANTIC AND PACIFIC OCEANS

[By the Marine Division, W. F. McDonald, in charge]

NORTH ATLANTIC OCEAN

By W. F. McDONALD

Atmospheric pressure.—May 1933 was a month with average pressure remarkably close to normal over most of the North Atlantic Ocean. There was a maximum deficiency of less than two tenths of an inch in the vicinity of the Straits of Belle Isle, and an equal excess in the average for the Shetland Islands. Monthly average pressures otherwise varied less than a tenth of an inch from their respective normals.

Belle Isle was the point of largest barometric fluctuation during the month (as shown by fixed stations in table 1), with a range of values from 29.02 to 30.24 inches. Ships' reports, however, revealed a wider range of values than did land stations. The lowest reading at sea was 28.80, about 200 miles east of Cape Race, reported by the U.S. Coast Guard cutter *General Greene*, on the 15th, and the highest, 30.56, was reported by the American S.S. *Ala*, near 49° N., 25° W., on the 24th.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, May 1933*

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	In.	*In.*	*In.*		*In.*	
Julianehaab, Greenland	29.63		30.04	13	29.24	9
Reykjavik, Iceland	29.94	+0.02	30.25	27	29.52	20
Lerwick, Shetland Islands	29.99	+.19	30.25	22	29.68	9
Valencia, Ireland	29.93	−.02	30.28	23	29.42	3
Lisbon, Portugal	30.03	+.06	30.21	8, 9	29.49	2
Madeira	30.06	+.05	30.19	22		
Horta, Azores	30.14	−.02	30.39	24	29.71	2
Belle Isle, Newfoundland	29.75	−.19	30.24	31	29.02	15
Halifax, Nova Scotia	29.91	−.06	30.34	1	29.42	14
Nantucket	29.96	−.03	30.31	1	29.57	4
Hatteras	29.98	−.03	30.27	19	29.62	3
Bermuda	30.05	−.06	30.22	19	29.84	3, 7, 9
Turks Island	29.99	−.01	30.10	11	29.88	2, 3, 31
Key West	29.96	−.01	30.10	12	29.78	3
New Orleans	29.93	−.04	30.16	20	29.57	4
Cape Gracias, Nicaragua	29.85	−.05	29.94	6	29.78	3, 14

NOTE.—All data based on a.m. observations only, with departures compiled from best available normals related to time of observations, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—The month opened with a depression centered between the Azores and Portugal, attended by winds that reached whole gale force on the 1st, and continued of force 9 until the 3d.

From May 4th to 10th there was considerable cyclonic action between the American coast and Iceland, which produced scattered gales from day to day over a wide extent of the northern steamer lanes west of longitude 25°. The highest wind force of the month was reported during this period by the American steamship *American Farmer*, bound from New York to London, when, between 8 and 11 p.m. on the 7th, she encountered a sharp increase of wind from force 7 to force 11, near 40° N., 56° W.

Widespread gales were again reported on the 15th and 16th, over mid-Atlantic from the Azores to the Grand Banks. The series of cyclonic developments with which these gales were connected began with a small disturbance over Nova Scotia on the 11th, that moved slowly northeast and lingered over the western Atlantic until the 14th, when another low moved eastward from the St. Lawrence Valley, merged with that already in the Atlantic, and on the 15th, off Newfoundland, produced the deepest and most extensive low pressure area of the month. This low gradually spread out and diminished in intensity; reached maximum extent by the 20th, at which time it dominated all of the ocean north of the Azores; and died out within a few days thereafter.

After the 22d, there were only a few relatively weak and unimportant disturbances, which, however, produced scattered gales over the northeastern Atlantic.

There was, throughout the month, a noteworthy persistence of the high pressure belt over middle latitudes. It was not completely disrupted at any time, but was most greatly weakened and displaced far southward by the large cyclonic development of the 15th, described above.

Tropical storms.—A weak disturbance of tropical origin affected the western Caribbean and southern Gulf of Mexico between the 14th and 17th. It seems to have attained maximum intensity in the Yucatan Channel on the evening of the 15th, when the Honduran steamship *Sinaloa* observed a barometer reading of 29.58 inches, attended by shifting winds that for a short time reached the force of a strong gale. No other wind of gale force was reported in connection with this disturbance, which died out in the Gulf of Mexico.

Fog.—May, as usual, brought a great increase in the extent and frequency of fog on the North Atlantic. Fog was reported from every square along the main northern steamer routes, and southward past the Azores in mid-Atlantic, while reports in American waters were unusually numerous and ran far southward between the 70th and 75th meridians, almost to the latitude of the Bahamas. Ships' officers in several instances commented especially upon the unusual occurrence of fogs so far southward over the route between New York and the West Indian Passages.

Between Hatteras and Nova Scotia, fog occurred on 8 to 15 days; southeast of the Grand Banks and over the approaches to the English Channel, on 5 to 9 days; and with lesser frequency elsewhere.

OCEAN GALES AND STORMS, MAY 1933

Vessel	Voyage		Position at time of lowest barometer		Gale began	Time of lowest barometer	Gale ended	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Baron Kelvin, Br.S.S.	Gibraltar	Philadelphia	35 27 N	13 20 W	May 1	8a, May 1	May 2	29.43	S	S, 10	NW	S, 10	S-SSW.
Exermont, Am.S.S.	Casablanca	Boston	37 06 N	13 00 W	do	1a, 2	May 3	29.36	S	SSW, 9	W	SSW, 9	SSW-W.
Baron Kelvin, Br.S.S.	Gibraltar	Philadelphia	35 07 N	18 01 W	May 3	3a, 3	May 4	29.90	SW	SW, 9	W	WSW, 9	W-SW-W.
Cyrus Field, Br.S.S.	Halifax	Newfoundland	46 20 N	54 05 W	May 5	10p, 5	May 7	29.30	W	W, 8	WSW	W, 9	WSW-WNW-WSW.
Emanuel Nobel, Belg. S.S.	Antwerp	Philadelphia	44 42 N	38 25 W	May 7	1p, 7	May 8	29.92	WNW	W, 9	NW	SW, 10	SSW-W-NW.
American Farmer, Am. S.S.	New York	London	40 22 N	56 09 W	do	11p, 7	do	29.31	N	NW, 11	NNW	NW, 11	SSW-NW.
Ala, Am.S.S.	Chester, Pa.	Rotterdam	45 09 N	39 50 W	May 8	6p, 8	do	29.48	SSW	SW, 8	W	S, 9	S-SW-W.
Manhattan, Am.S.S.	Cobh	New York	46 22 N	40 00 W	May 7	7p, 8	May 9	29.33	WSW	S, 9	WNW	S, 9	S-W.
Colytto, Du.S.S.	Swansea	Montreal	50 16 N	37 25 W	May 8	11p, 8	May 10	29.39	S	S	W	SW, 10	S-SW.
Frederick VIII, Dan. S.S.	New York	Christiansand	51 10 N	38 20 W	do	11p, 8	May 9	28.99	SE	S, 7	SW	SW, 8	S-SW.
Exporter, Am.S.S.	Lisbon	New York	36 52 N	57 50 W	May 9	6p, 9	do	29.47	SW	WSW, 9	NW	WSW, 9	SW-NW.
Stuttgart, Ger.S.S.	Bremerhaven	do	50 28 N	29 56 W	May 10	8a, 10	May 10	29.89	WSW	S, 9	WSW	S, 9	WSW-S-W.
Noreg, Nor.M.S.	Port Arthur	Bordeaux	39 40 N	56 38 W	May 11	4p, 11	May 13	29.39	SW	W, 8	NNW	NNW, 9	W-NW.
Tuscarora, Br.S.S.	Philadelphia	Belfast	39 50 N	56 28 W	May 10	7p, 11	May 14	29.65	S	WNW, 8	W	NW, 9	W-NW.
Exermont, Am.S.S.	Casablanca	Boston	43 02 N	52 04 W	May 11	8p, 11	May 12	29.42	ESE	NE, 6	NW	NNW, 9	ESE-N-WNW
Jean Jadot, Belg. S.S.	Antwerp	New York	43 55 N	51 58 W	do	10p, 11	do	29.51	N	NNE, 5	N	N, 9	Steady.
Quaker City, Am.S.S.	Boston	Southampton	42 30 N	49 07 W	May 12	10a, 12	May 14	29.36	NNW	NNW, 7	NW	NNW, 10	NNW-NW.
Exeter, Am.S.S.	Gibraltar	Boston	41 36 N	41 04 W	do	8p, 12	May 13	29.21	S	WNW	NW	WNW, 10	SW-WNW.
Baron Kelvin, Br.S.S.	do	Philadelphia	35 40 N	53 06 W	May 11	—, 12	do	29.95	W	WNW, 9	N	WNW, 9	W-WNW.
Hercules, Du.S.S.	West Indies	English Channel	39 13 N	40 18 W	May 12	4a, 13	May 14	29.49	SSW	W, 9	WSW	W, 9	Steady.
Jason, Du.S.S.	Canal Zone	do	41 57 N	39 09 W	May 10	8p, 13	do	29.44	WNW	W, 9	SW	W, 9	SW-WSW.
Black Falcon, Am.S.S.	Antwerp	New York	47 08 N	38 08 W	May 14	Noon, 14	May 18	29.11	SSE	SSE, 8	NW	S, 8	SSE-SW-NW
Quaker City, Am.S.S.	Boston	Southampton	45 53 N	39 40 W	do	2 p, 14	May 16	29.40	NW	NW, 7	S	S, 9	NW-S.
Sinaloa, Hond.S.S.	Mobile	Bluefields	22 20 N	87 11 W	May 15	7 p, 15	do	29.58	E	SE, 3	SSW	S, 9	NE-SE.
Motocarline, Belg.S.S.	Antwerp	Baton Rouge	40 31 N	37 43 W	do	1 a, 16	do	29.45	SW	SW, 9	W	SW, 9	SW-W.
Saleier, Du.S.S.	Gibraltar	New York	40 40 N	37 00 W	May 13	4 a, 16	May 19	29.43	S	SW, 8	N	S, 10	SW-W.
Tennessee, Dan.S.S.	Norfolk	Rotterdam	41 30 N	44 35 W	May 16	9 a, 16	May 17	29.45	W	W, 10	W	W, 10	Steady.
Europa, Ger.S.S.	New York	Cherbourg	42 54 N	41 36 W	do	Noon, 16	May 16	29.33	W	W, 9	W	W, 9	
Youngstown, Am.S.S.	Galveston	Le Havre	43 27 N	39 39 W	do	3 p, 16	do	29.40	SW	SW, 8	WSW	WSW, 9	SW-WSW.
Bremen, Ger.S.S.	Bremerhaven	New York	46 30 N	35 24 W	do	11 p, 16	May 17	29.17	SSW	WSW, 9	W	WSW, 10	
Saturnia, Ital.M.S.	Gibraltar	do	37 52 N	36 00 W	May 15	Mdt. 16	do	29.82	SW	SW, 8	NNW	SW, 8	SW-W-NW.
Ogontz, Am.S.S.	Lisbon	New Orleans	45 45 N	25 00 W	May 18	8 p, 18	May 19	29.59	WSW		WNW	WNW, 9	Steady.
Themisto, Du.S.S.	Swansea	Montreal	48 58 N	44 12 W	May 24	8 p, 24	May 25	29.34	SE	NW, 9	WSW	NW, 9	SE-NW.
Frederick VIII, Dan.S.S.	Oslo	New York	51 10 N	38 15 W	do	2 a, 25	do	29.42	S	SSW, 8	SW	WSW, 9	ESE-S-SW.
Steel Ranger, Am.S.S.	Swansea	Montreal	47 20 N	44 11 W	May 26	4 a, 26	May 27	29.40	W	SSW, 6	W	WNW, 9	SSW-WNW.
Ala, Am.S.S.	Antwerp	New York	46 35 N	40 12 W	May 27	Noon, 27	do	29.53	SSE	SW	W	SSE, 9	SSE-SW.
Gonzenheim, Ger.S.S.	Rotterdam	Newfoundland	52 30 N	39 51 W	do	5 p, 27	May 28	29.16	SW	SE, 8	S	SE, 8	SE-SW.
NORTH PACIFIC OCEAN													
Golden River, Am.S.S.	San Francisco	Osaka	44 40 N	178 45 W	Apr. 30	4 p, 30	May 2	28.96	NNW	NNW, 7	WNW	WNW, 10	W-NNW.
President Taft, Am.S.S.	Victoria	Yokohama	39 09 N	146 00 E	May 3	1 a, 4	May 4	29.44	SE	S, 9	WNW	S, 10	S-SSW.
Pulpit Point, Br.S.S.	Yangtse River	San Francisco	36 40 N	143 50 E	do	Mdt, 3	do	29.63	S		SSW	SSW, 8	Steady.
Grays Harbor, Am.S.S.	Puget Sound	Yokohama	42 59 N	152 22 E	do	8 a., 3	do	29.66	SSE	S, 10	WSW	SSE, 10	SSE-S.
Greystoke Castle, Br. M.S.	San Pedro	Manila	33 33 N	119 46 W	do	4 p, 3	do	29.99	WNW	WNW, 7	NNW	NW, 8	WNW-NW.
Montanan, Am.S.S.	Balboa	Los Angeles	24 39 N	113 16 W	May 22	Noon, 22	May 23	29.81	NW	NW, 8	NNW	NW, 8	NW-NNW.
Potter, Am.M.S.	do	San Pedro	12 32 N	93 03 W	May 30	8 p., 30	May 31	29.71	SW	SW, 8	WNW	SW, 8	SW-WNW.
Pennsylvanian, Am.S.S.	do	Los Angeles	13 47 N	93 30 W	May 31	1 p., 31	June 1	29.44	WSW	NW, 3	N	N, 11	WNW-NW.
SOUTH ATLANTIC OCEAN													
Moron, French S.S.	Antwerp	Buenos Aires	30 10 S	47 50 W	May 6	8 a., 6	May 5	29.65	W	W, 10	SSE	W, 10	W-SSE

[1] Uncorrected.

NORTH PACIFIC OCEAN, MAY 1933

By WILLIS E. HURD

Atmospheric pressure.—Although several depressions crossed the northern part of the ocean during May 1933, and the barometer fell as low as 29.03 inches on the 13th at St. Paul, nevertheless the average pressure over the eastern part of the Aleutian Islands and the Bering Sea was above normal. The average position of the center of the Aleutian cyclone (St. Paul 29.84 inches) was over the Gulf of Alaska, with subnormal pressure over the eastern portion.

The North Pacific anticyclone covered the major part of the ocean throughout most of the month. Only one depression crossed this area. That appeared near Midway Island on the 5th, remained in that neighborhood until the 8th, and merged with the Aleutian LOW on the 13th. Pressure was mostly above normal from coast to coast in middle latitudes, but below normal in the eastern and western tropics.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, May 1933, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	30.02	−0.07	30.44	7	29.58	21
Dutch Harbor	29.91	+.07	30.42	6, 7	29.24	14
St. Paul	29.91	+.07	30.36	6	29.02	13
Kodiak	29.84	.00	30.18	9, 10	29.30	20
Juneau	29.58	−.11	30.22	10	29.59	1
Tatoosh Island	29.99	−.02	30.32	27	29.46	7
San Francisco	30.06	+.07	30.28	6	29.82	27
Mazatlan	29.86	−.06	29.92	17	29.78	23
Honolulu	30.09	+.04	30.18	21	29.98	14
Midway Island	30.08	+.03	30.26	12, 13	29.58	5
Guam	29.85	−.03	29.96	3	29.76	8, 18
Manila	29.82	−.03	29.94	2	29.72	29
Naha	29.90	+.08	30.10	3	29.62	28
Chichishima	29.97	+.06	30.22	13	29.60	27
Nemuro	29.95		30.26	1	29.44	3

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Cyclones and gales.—Few important cyclones occurred during May, and shipping was little affected by stormy conditions; vessels reported few gales and these apparently were local. On the 3d and 4th, south gales of force 10 occurred east of Japan, associated with a cyclone central over the Japan Sea. On the 2d a whole gale was experienced near 44° N., 176° E., in connection with an Aleutian disturbance. On several days strong northwest winds were encountered off the coast of Lower California, but the highest velocity was only that of a fresh gale, on the 23d.

A small cyclone developed south of the Gulf of Tehuantepec on May 30; a fresh southwest gale was reported at 8 p.m. near 12°30′ N., 93° W.; at 1 p.m. of the 31st the American steamer *Pennsylvanian*, in 13°47′ N., 93°30′ W., had a corrected barometer reading of 29.44 inches, with a light northwest wind—the maximum velocity experienced was of force 11 from the north. The cyclone seems to have filled in rapidly on that date off the Guatemalan coast.

Fog.—Two to eight or more days with fog were experienced by ships along that part of the northern routes lying west of longitude 145° W. The most frequent and extensive fog banks of this great area occurred between the western Aleutians and the Kuril and Japanese islands. Fog was reported on 7 days off the California coast and on 3 days off Lower California and Cape Corrientes.

INTENSE HURRICANE IN THE SOUTH PACIFIC OCEAN, APRIL 6–12, 1933

By WILLIS E. HURD

The Weather Bureau has received through the Hydrographic Office at Cristobal, Canal Zone, a report of an intense hurricane in tropical waters of the South Pacific during April 1933. The report was furnished by the French steamship *Boussole;* Captain Courcet; observer Winnaert.

According to the information given by this ship, which inclosed a supplemental report from the French steamship *Bucephale*, the hurricane probably originated very early in the month to the northward of the Fiji Islands. The *Bucephale*, lying at anchor in Surrender Bay, New Hebrides, experienced moderate to fresh gales, mostly southwesterly, on the 6th and 7th. At 2 a.m. of the 8th the barometer (correction unknown) at Epi Island fell to 711 mm (27.99 inches), with an east wind of hurricane force that ruined even stone-built houses.

The *Boussole* lay at Noumea, New Caledonia, on the 9th and 10th, and experienced hurricane winds during the early hours of the 10th, lowest pressure 28.92 inches. The gale there lasted for 19 hours. A storm wave in Noumea Roads threw one steamer ashore on the rocks, and caused the loss of many lighters and small boats. The city itself experienced considerable damage.

According to a radiogram received at Noumea on the 12th from Brisbane the cyclone, still intense, was central about 400 miles southwest of Kunie Island (Isle of Pines), New Caledonia, moving in an east-southeast direction.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Condensed climatological summary of temperature and precipitation by sections, May 1933

[For description of tables and charts, see REVIEW, January, p. 37]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	76.1	+4.8	Brewton (near)	100	25	Valley Head	45	[1]3	2.41	−1.51	Riverton	7.86	Elba	0.00
Arizona	62.6	−4.9	Quartzsite	113	29	Williams	8	11	.19	−.14	Mormon Lake	1.93	41 Stations	.00
Arkansas	71.8	+2.7	2 stations	96	[1]19	3 stations	41	[1]2	6.27	+1.24	Sunset	12.40	Carthage	2.30
California	55.2	−6.1	Greenland Ranch	114	29	Twin Lakes	−4	8	1.61	+.60	Crescent City (near)	12.44	5 stations	.00
Colorado	50.5	−1.5	Las Animas	99	23	Lake Moraine	−3	13	1.92	+.04	Hawthorne	4.80	Saguache	.08
Florida	78.9	+3.3	Blountstown	102	23	Glen St. Mary	52	19	2.59	−1.40	Fort Myers	6.86	Ocala	.51
Georgia	76.7	+5.0	2 stations	101	[1]15	Clayton	42	9	2.76	−.66	Blairsville	11.10	2 stations	.68
Idaho	48.8	−3.9	Indian Cove	96	30	2 stations	11	[1]8	1.65	−.04	Deadwood	4.31	Bakers Ranch	.40
Illinois	64.4	+2.0	2 stations	93	20	Freeport	32	4	8.02	+3.87	Anna	12.09	Pearl	4.58
Indiana	65.0	+2.9	Edwardsport	93	21	3 stations	31	4	8.14	+4.08	Princeton	12.86	Albion	3.66
Iowa	60.5	+.6	3 stations	93	[1]18	7 stations	32	[1]3	4.36	+.23	Burlington	10.46	Little Sioux	.33
Kansas	64.3	+.7	Ellsworth	105	19	St. Francis	32	13	3.80	+.09	Parsons	11.27	Anthony	.92
Kentucky	68.7	+5.4	Frankfort	95	25	2 stations	40	7	6.43	+2.41	Cold Spring	10.46	Lexington	3.47
Louisiana	77.9	+4.2	2 stations	97	[1]18	Robeline	50	3	4.65	+.13	Franklinton	9.32	Port Eads	.50
Maryland-Delaware	65.0	+2.6	Bell, Md	94	27	Oakland, Md	34	22	5.42	+2.01	Grantsville, Md	8.62	Aberdeen, Md	3.79

[1] Other dates also.

Condensed climatological summary of temperature and precipitation by sections, May 1933—Continued

Section	Temperature							Precipitation					
	Section average	Departure from the normal	Monthly extremes					Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.	In.	In.		In.		In.
Michigan	56.4	+2.6	Flint	92	26	Wolverine	14 4	4.05	+.86	Ganges	7.42	Painesdale	.66
Minnesota	55.9	+1.0	Pipestone	94	18	Cambridge	19 [1] 2	3.78	+.54	Minneapolis, No. 1	8.92	Baudette	.44
Mississippi	76.5	+4.8	Crystal Springs	98	27	Water Valley	47 3	4.07	−.34	Water Valley	9.80	Stoneville	1.25
Missouri	65.9	+1.6	Macon	96	20	Harrisonville	35 1	7.53	+2.73	2 stations	12.97	Grant City	2.23
Montana	60.4	−1.0	4 stations	94	[1] 30	Lima	18 [1] 9	2.41	+.15	Philipsburg	4.84	Superior	.50
Nebraska	57.8	−1.3	McCook	98	[1] 18	2 stations	27 2	2.97	−.56	Hull (near)	6.00	Tekamah	.38
Nevada	51.1	−4.2	Clay City	105	30	Marlette Lake	4 3	.91	+.02	Marlette Lake	3.94	Lovelock	.00
New England	57.3	+2.3	Waterbury, Conn	93	27	2 stations	21 [1] 6	2.42	−.95	Gloucester, Mass	4.74	Gardiner, Maine	1.03
New Jersey	63.2	+2.8	5 stations	93	27	do	32 [1] 5	4.84	+1.11	Camden	6.98	Culvers Lake	2.56
New Mexico	57.2	−2.3	2 stations	100	[1] 20	Selsor Ranch	7 1	.68	−.44	Valmora	3.75	8 stations	.00
New York	58.9	+3.0	Lowville	96	20	2 stations	20 [1] 5	3.40	−.13	Allegany State Park	7.86	Spier Falls	1.48
North Carolina	70.7	+3.9	2 stations	99	[1] 26	Banners Elk	35 4	4.58	+.40	Brevard	10.54	Durham	1.48
North Dakota	54.7	+1.9	Max	98	31	Dunseith	19 [1] 3	3.15	+.75	Mohall	5.41	Edmore	1.43
Ohio	63.6	+3.2	3 stations	92	[1] 20	Holgate	30 4	6.44	+2.72	Greenville	12.00	Akron	2.61
Oklahoma	70.7	+2.5	Buffalo	103	19	Kenton	32 4	4.70	−.02	Sulphur	13.78	Supply	.55
Oregon	48.6	−4.4	Prairie City	95	29	3 stations	11 [1] 6	2.78	+.99	Brookings	11.35	Seneca	.15
Pennsylvania	62.2	+2.8	Ardmore	94	27	Arendtsville	24 6	5.86	+1.96	Huntingdon	10.52	Matamoras	2.17
South Carolina	74.9	+4.0	4 stations	100	[1] 14	2 stations	44 4	3.19	−.43	Caesars Head	6.71	Kingstree	.86
South Dakota	55.6	−.6	2 stations	98	31	Bellefourche	24 2	3.15	+.11	Harveys Ranch	8.22	Yankton	1.38
Tennessee	70.8	+4.0	Etowah	98	21	Elkmont	38 5	7.15	+2.93	Fayetteville	11.57	Rockwood	3.69
Texas	75.9	+2.8	Eagle Pass	107	[1] 8	Romero	32 [1] 3	3.95	+.24	Clarksville	12.97	3 stations	.00
Utah	49.6	−5.5	St. George	100	30	Soldiers Summit	7 1	1.92	+.70	Great Basin Experiment Station.	5.75	Escalante	.12
Virginia	67.9	+3.9	Clarksville	97	[1] 15	Callaville	36 19	5.30	+1.55	Danville	7.72	Norfolk	1.76
Washington	50.7	−3.6	Alpowa Ranch	92	25	Stockdill Ranch	21 6	2.72	+.73	Quinault	13.35	Cle Elum	.45
West Virginia	65.1	+3.4	New Cumberland	97	23	Bayard	34 22	6.99	+2.98	Buckhannon	11.36	Harpers Ferry	3.50
Wisconsin	56.3	+1.3	Marinette	89	20	Long Lake	16 4	5.02	+1.35	Darlington	12.31	Ashland	1.19
Wyoming	46.8	−2.4	3 stations	92	31	Foxpark	2 12	2.54	+.42	Bechler River	6.93	Lookout (near)	.42
Alaska (April)	30.7	+3.0	Porcupine Creek	60	23	Barrow	−21 1	1.40	−.10	View Cove	11.70	5 stations	T.
Hawaii	71.2	−.5	Kaanapali	90	[1] 8	Kanalohuluhulu	44 14	3.93	−1.87	Pihonua	27.59	4 stations	.00
Puerto Rico	77.4	+.2	Dorado	94	4	Guineo Reservoir	50 1	13.52	+6.97	San Cristobal	32.52	Sabana Grande	5.75

[1] Other dates also.

TABLE 1.—*Climatological data for Weather Bureau stations, May 1933*

(Compiled by Annie E. Small)

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F.*		°*F.*	°*F.*		°*F.*	°*F.*	°*F.*	°*F.*	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
New England							**57.1**	**+2.5**										**74**	**2.39**	**−0.8**										**5.3**		
Eastport	76	67	85	29.84	29.93	−0.03	48.4	+0.7	76	19	58	29	8	39	34	44	41	79	3.74	+0.7	11	8,061	sw.	27	nw.	15	10	11	10	5.2	0.0	0.0
Greenville, Maine	1,070	6	----	28.76	29.92	------	51.6	------	80	18	64	26	8	39	46	----	----	----	3.72	------	12	5,323	se.	28	----	14	10	9	12	----	T	.0
Portland, Maine	103	82	117	29.82	29.94	−.03	55.2	+1.9	82	20	63	36	8	47	29	49	44	69	2.22	−1.2	10	6,908	s.	30	nw.	4	18	7	6	4.0	.0	.0
Concord	289	70	79	29.64	29.95	−.03	57.8	+3.5	86	26	70	32	6	45	50	----	----	----	2.44	−.6	10	4,704	nw.	21	nw.	15	21	4	6	3.6	.0	.0
Burlington	403	11	48	29.51	29.94	−.03	55.8	−.7	80	19	67	29	9	45	39	----	----	----	2.16	−.7	13	7,428	s.	32	s.	1	9	7	15	6.0	.0	.0
Northfield	876	12	60	------	29.94	−.03	54.0	+1.2	82	18	67	24	8	40	52	----	----	75	2.14	−.6	11	6,337	s.	25	sw.	14	6	15	10	6.0	.0	.0
Boston	125	106	165	29.81	29.95	−.03	61.6	+4.5	90	20	71	40	8	52	31	53	47	65	2.74	−.4	9	6,416	sw.	27	nw.	4	9	15	7	5.3	.0	.0
Nantucket	12	14	90	29.94	29.95	−.04	55.6	+3.3	79	26	63	41	5	48	24	51	48	82	1.62	−1.2	7	9,768	sw.	35	s.	10	9	13	9	5.2	.0	.0
Block Island	26	11	46	29.92	29.95	−.04	55.6	+2.8	77	26	62	43	9	49	20	52	50	87	1.59	−1.9	6	9,772	s.	36	s.	10	6	11	14	6.3	.0	.0
Providence	160	215	251	29.78	29.95	−.03	60.7	+2.2	89	27	70	41	8	52	39	52	45	63	4.10	+1.1	11	7,881	se.	30	nw.	14	10	10	11	5.3	.0	.0
Hartford	159	122	----	29.77	29.94	−.04	62.2	+4.7	91	27	72	40	5	52	35	----	----	----	1.59	−2.0	10	------	s.	----	----	----	8	10	13	6.2	.0	.0
New Haven	106	74	153	29.85	29.96	−.03	61.4	+3.5	91	27	70	44	8	53	29	55	50	73	2.00	−1.7	11	6,189	s.	27	sw.	27	6	10	15	6.5	.0	.0
Middle Atlantic States							**65.3**	**+3.0**										**74**	**4.50**	**+1.1**										**6.6**		
Albany	97	107	115	29.84	29.95	−.03	62.0	+2.7	87	26	72	37	8	52	33	55	49	65	2.41	−.5	14	5,956	s.	24	se.	2	7	14	10	5.9	.0	.0
Binghamton	871	60	68	29.03	29.96	−.02	60.1	+2.7	84	20	71	32	5	50	38	----	----	----	3.32	.0	12	4,209	nw.	20	sw.	1	2	6	23	8.1	.0	.0
New York	314	414	454	29.61	29.94	−.05	62.8	+2.2	86	27	71	45	8	54	26	56	51	72	5.93	+2.7	13	9,095	sw.	51	nw.	20	5	11	15	7.0	.0	.0
Bellefonte	1,050	5	42	28.84	29.95	------	59.2	------	83	26	69	35	5	49	35	55	52	80	5.46	------	23	------	sw.	----	----	----	1	9	21	8.2	.0	.0
Harrisburg	374	94	104	29.55	29.95	−.03	64.2	+2.4	88	24	73	43	9	56	27	57	53	72	5.53	+2.1	19	5,097	w.	31	ne.	24	4	12	15	7.0	.0	.0
Philadelphia	114	123	367	29.85	29.97	−.02	66.3	+3.4	89	27	75	45	8	58	24	58	54	70	6.93	+3.7	16	8,619	sw.	68	nw.	24	4	10	17	6.8	.0	.0
Reading	323	283	304	29.61	29.96	------	64.0	+1.5	90	20	73	41	5	55	28	57	53	70	5.42	+1.8	18	7,476	nw.	70	nw.	20	5	10	16	6.8	.0	.0
Scranton	805	72	103	29.10	29.95	−.03	61.4	+2.0	85	26	72	36	5	51	35	55	50	69	3.82	+.6	16	4,705	sw.	19	nw.	20	5	12	14	6.3	.0	.0
Atlantic City	52	37	172	29.90	29.96	−.02	61.2	+3.1	87	14	67	46	9	55	26	57	55	84	4.32	+1.3	13	10,466	s.	37	s.	27	4	10	17	6.9	.0	.0
Sandy Hook	22	10	55	29.93	29.95	------	61.6	------	87	27	69	44	8	54	22	56	53	80	4.93	+1.2	15	7,914	s.	46	nw.	20	5	9	17	6.3	.0	.0
Trenton	190	159	183	29.76	29.96	------	64.2	+3.1	90	27	74	44	9	54	32	57	53	74	4.91	+1.8	15	6,246	s.	32	nw.	20	5	14	12	6.7	.0	.0
Baltimore	123	100	215	29.83	29.96	−.03	67.1	+2.7	93	24	75	46	8	59	29	60	55	70	5.17	+1.6	17	7,277	sw.	37	n.	20	3	12	16	7.0	.0	.0
Washington	112	62	85	29.84	29.96	−.04	67.2	+3.5	91	24	76	47	9	58	29	60	55	72	6.26	+2.6	18	4,670	s.	27	nw.	20	4	13	14	6.5	.0	.0
Cape Henry	18	8	54	29.94	29.96	------	68.9	+4.7	94	27	76	47	5	62	27	63	61	79	2.51	−1.1	6	8,036	se.	34	n.	30	5	18	8	5.7	.0	.0
Lynchburg	681	153	188	29.23	29.96	−.04	69.7	+2.4	93	26	80	46	19	59	33	63	60	74	4.26	+.6	10	4,619	w.	29	nw.	20	8	18	5	5.0	.0	.0
Norfolk	91	170	205	29.88	29.97	−.03	71.1	+4.9	92	26	80	50	5	62	25	63	60	74	1.76	−2.0	7	8,515	s.	31	nw.	30	2	13	16	7.0	.0	.0
Richmond	144	11	52	29.82	29.97	−.02	70.1	+3.6	93	26	81	45	19	60	35	62	59	75	4.84	+1.0	14	5,604	ne.	46	nw.	26	5	16	10	6.0	.0	.0
Wytheville	2,304	49	55	27.64	29.96	−.03	64.7	+3.3	86	25	75	45	18	54	34	58	55	75	4.26	+.6	14	4,998	w.	24	w.	14	8	14	9	5.6	.0	.0
South Atlantic States							**74.8**	**+4.6**										**73**	**3.29**	**−0.2**										**4.4**		
Asheville	2,253	89	104	27.68	29.98	−.01	67.8	+5.2	90	13	80	44	4	56	38	60	56	73	4.23	+.8	13	5,604	nw.	29	nw.	10	8	15	8	5.3	.0	.0
Charlotte	779	244	267	29.16	29.98	−.01	73.0	+4.1	92	25	83	52	4	63	27	63	59	67	2.46	−1.2	6	8,295	sw.	45	n.	10	11	14	6	4.9	.0	.0
Greensboro	886	6	56	29.04	29.98	------	70.0	------	94	25	82	45	4	58	33	63	59	73	3.38	------	10	5,899	sw.	32	nw.	30	9	15	7	5.1	.0	.0
Hatteras	11	5	50	29.96	29.97	−.04	72.4	+3.7	86	14	78	60	4	67	15	68	66	81	6.52	+2.8	12	8,798	sw.	41	w.	16	16	9	6	3.7	.0	.0
Raleigh	376	103	146	29.58	29.96	−.03	73.3	+4.8	94	26	84	51	4	62	29	64	59	66	2.66	−1.2	11	6,417	sw.	30	nw.	30	9	15	7	5.1	.0	.0
Wilmington	72	73	106	29.92	29.99	−.02	74.3	+3.5	94	21	83	53	18	66	27	68	66	79	3.34	−.1	9	7,030	sw.	30	nw.	3	15	12	4	4.0	.0	.0
Charleston	48	11	92	29.95	30.00	−.01	77.9	+5.2	95	14	85	62	18	70	22	71	68	79	1.76	−1.2	4	8,059	sw.	26	w.	27	18	9	4	3.6	.0	.0
Columbia, S.C.	351	41	57	29.61	29.98	−.02	77.0	+5.1	96	15	88	56	4	66	28	66	61	65	5.82	+2.7	9	5,326	sw.	23	sw.	30	17	10	4	4.0	.0	.0
Greenville, S.C.	1,039	139	146	28.90	29.98	------	72.9	+5.7	92	21	83	52	4	63	27	64	59	68	3.45	−.6	10	6,517	sw.	39	sw.	27	15	9	7	4.3	.0	.0
Augusta	182	62	77	29.78	29.97	−.02	77.8	+5.4	97	21	90	60	19	66	29	67	63	66	2.06	−1.0	9	4,547	s.	24	nw.	27	12	13	6	4.5	.0	.0
Savannah	65	73	152	29.92	29.99	−.01	78.2	+4.8	96	14	88	61	19	69	26	71	69	80	.86	−2.2	5	7,651	s.	25	se.	30	13	12	6	4.5	.0	.0
Jacksonville	43	209	245	29.95	30.00	.00	78.6	+3.6	91	10	87	62	19	71	23	71	68	78	3.04	−1.0	8	7,857	s.	30	n.	29	11	17	3	4.4	.0	.0
Florida Peninsula							**80.4**	**+3.1**										**77**	**2.48**	**−1.8**										**6.0**		
Key West	22	10	64	29.94	29.96	0.01	81.8	+2.7	90	8	86	73	20	77	13	75	72	77	1.47	−2.1	13	7,957	e.	22	se.	15	10	13	8	5.2	.0	.0
Miami	25	124	168	29.97	30.00	+.01	79.8	+3.4	87	9	84	67	30	76	18	73	71	76	4.67	−1.6	10	7,942	se.	25	se.	30	8	10	13	6.1	.0	.0
Tampa	35	88	197	29.96	29.99	.00	79.6	+3.3	93	24	89	65	1	71	23	72	70	77	1.30	−1.7	6	7,395	se.	30	ne.	18	21	7	3	3.4	.0	.0
Titusville	44	5	----	29.94	29.99	------	79.4	------	93	10	88	66	31	71	24	----	----	----	3.20	------	4	------	se.	----	----	----	19	10	2	3.4	.0	.0
East Gulf States							**77.0**	**+4.6**										**73**	**2.24**	**−1.6**										**4.5**		
Atlanta	1,173	190	198	28.77	29.98	−.01	74.1	+4.2	91	21	84	53	4	65	25	64	59	64	3.22	−.2	8	6,188	w.	30	nw.	27	13	12	6	4.5	.0	.0
Macon	370	76	84	29.59	29.98	−.01	76.9	+4.6	96	15	88	54	4	66	30	68	63	67	1.98	−1.0	7	4,768	sw.	21	n.	10	13	10	8	4.4	.0	.0
Thomasville	273	49	103	29.70	29.98	−.01	78.6	+4.6	95	23	88	60	19	69	26	70	67	75	.82	−2.8	8	5,553	sw.	25	sw.	27	10	13	8	5.3	.0	.0
Apalachicola	36	11	51	29.94	29.98	------	78.2	------	88	31	84	65	2	72	22	73	71	80	.57	−2.8	5	6,334	se.	29	e.	18	10	13	8	4.6	.0	.0
Pensacola	56	149	185	29.91	29.97	−.02	77.5	+3.6	90	17	82	64	3	73	20	73	72	84	2.93	−.4	9	9,055	s.	37	se.	4	14	11	6	3.9	.0	.0
Anniston	741	9	57	----	----	----	74.3	+5.9	94	21	86	48	3	62	34	----	----	----	2.61	−1.3	5	------	w.	----	----	----	11	9	11	----	----	.0
Birmingham	700	11	48	29.21	29.96	−.02	75.8	+4.7	93	25	86	51	3	65	26	66	61	67	3.03	−.9	9	5,428	s.	27	se.	5	19	9	3	3.6	.0	.0
Mobile	57	125	161	29.89	29.95	−.04	78.2	+3.8	92	18	85	60	3	72	26	72	69	79	1.48	−2.8	6	7,422	s.	32	se.	2	14	8	9	4.6	.0	.0
Montgomery	223	100	112	29.73	29.97	−.02	78.6	+5.2	95	21	88	58	3	69	28	68	63	65	1.76	−2.1	8	5,122	s.	28	n.	31	16	9	6	4.2	.0	.0
Corinth	469	6	----	----	----	----	74.8	------	96	21	86	50	4	64	33	----	----	----	7.30	------	10	------	s.	----	----	----	5	24	2	----	----	.0
Meridian	375	87	95	29.55	29.93	−.05	76.8	+5.5	92	21	87	54	3	67	29	68	64	69	1.76	−2.6	8	4,692	s.	32	s.	2	13	15	3	4.3	.0	.0
Vicksburg	247	65	73	29.66	29.92	−.05	76.8	+3.9	90	19	85	57	3	68	24	69	66	74	3.60	−.7	4	5,608	s.	22	se.	1	10	12	9	5.1	.0	.0
New Orleans	53	76	84	29.88	29.93	−.04	79.8	+4.4	92	29	87	64	3	73	19	72	70	77	3.01	−1.6	8	5,328	se.	18	se.	23	8	15	8	5.2	.0	.0
West Gulf States							**76.7**	**+3.3**										**73**	**4.09**	**0.0**										**4.9**		
Shreveport	249	92	227	29.62	29.88	−.07	77.8	+4.2	93	19	87	57	2	68	26	69	65	71	3.86	−.4	10	8,014	s.	35	s.	22	13	13	5	4.5	.0	.0
Bentonville	1,303	11	44	28.50	29.84	−.09	67.5	+1.1	88	20	78	44	2	57	34	----	----	----	9.62	------	14	4,867	s.	32	s.	12	12	3	16	----	----	.0
Fort Smith	457	79	94	29.38	29.86	−.07	71.8	+2.2	92	20	82	48	2	62	37	64	60	72	6.26	+1.4	11	6,430	e.	32	s.	23	10	10	11	5.4	.0	.0
Little Rock	357	136	153	29.53	29.89	−.06	72.2	+1.9	90	20	81	52	4	63	33	64	60	70	5.93	+1.2	15	6,293	s.	27	se.	11	9	11	11	5.8	.0	.0
Austin	605	136	148	29.21	29.83	------	78.8	+4.2	94	20	89	57	3	68	32	68	63	67	3.63	−1.0	5	6,864	se.	34	nw.	3	13	13	5	4.5	.0	.0
Brownsville	57	83	100	29.74	29.80	------	81.1	+2.5	96	1	88	65	5	74	28	75	73	83	4.85	+2.6	6	8,692	se.	29	n.	25	12	18	1	4.4	.0	.0
Corpus Christi	20	11	78	29.83	29.85	−.05	79.4	+3.2	90	4	85	63	5	74	23	74	73	83	3.69	+.5	5	9,279	se.	35	n.	25	7	14	10	6.1	.0	.0
Dallas	512	220	227	29.31	29.85	------	74.8	------	92	8	83	54	2	66	28	----	----	----	6.65	+2.2	8	9,577	se.	42	ne.	29	17	5	9	3.7	.0	.0
Fort Worth	670	106	114	29.13	29.83	−.08	75.5	+3.2	96	9	85	54	2	66	32	66	60	64	4.67	.0	9	7,616	se.	27	se.	3	14	7	10	4.9	.0	.0
Galveston	54	106	114	29.82	29.88	−.06	79.0	+4.2	92	31	83	65	4	75	20	73	71	82	1.43	−2.0	4	8,766	se.	29	n.	4	10	11	10	5.3	.0	.0
Houston	138	292	314	29.73	29.88	------	79.1	+3.6	93	17	87	60	4	71	28	----	----	----	1.83	−2.7	7	9,126	se.	38	nw.	4	10	12	9	5.4	.0	.0
Palestine	510	64	72	29.36	29.88	−.05	76.4	+3.7	91	18	85	55	3	68	28	68	65	73	5.39	+.8	6	6,151	s.	28	sw.	24	11	13	7	5.1	.0	.0
Port Arthur	34	58	66	29.84	29.88	------	80.1	------	94	31	86	60	4	74	25	----	----	----	2.48	−1.6	5	6,542	s.	28	nw.	4	10	19	2	4.4	.0	.0
San Antonio	693	242	301	29.10	29.80	−.10	79.8	+4.7	97	8	90	53	3	69	35	69	63	64	2.23	−1.0	5	9,550	se.	38	w.	3	10	15	6	5.1	.0	.0
Taylor	571	38	51	29.26	29.86	−.05	78.3	+4.0	94	8	89	57	3	68	31	----	----	----	4.42	+.4	5	7,536	s.	29	se.	13	14	10	7	4.4	.0	.0

TABLE 1.—*Climatological data for Weather Bureau stations, May 1933*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
							67.7	+2.8										73	7.07	+3.3										6.4		
Chattanooga	762	190	215	29.18	29.98	−0.01	72.6	+3.8	91	21	83	52	4	62	27	64	60	68	7.64	+3.8	14	5,865	sw.	34	w.	7	12	15	4	4.6	0.0	0.0
Knoxville	995	79	97	28.93	29.96	−.03	72.4	+5.2	93	25	83	50	4	62	29	63	58	67	4.45	+.7	10	5,070	s.	30	nw.	10	16	10	5	4.0	.0	.0
Memphis	399	78	86	29.49	29.91	−.05	73.4	+2.8	90	19	80	54	4	66	22	66	62	70	5.90	+1.7	10	5,858	sw.	30	sw.	22	10	7	14	5.7	.0	.0
Nashville	546	168	191	29.38	29.96	−.02	71.4	+3.2	90	25	81	52	4	62	26	64	60	72	9.94	+6.1	13	7,201	s.	47	nw.	7	9	11	11	5.8	.0	.0
Lexington	989	193	230	28.92	29.98	−.01	66.9	+2.6	86	24	75	44	4	58	28	----	----	----	3.47	−.3	15	9,436	sw.	43	nw.	28	11	11	9	5.0	.0	.0
Louisville	525	188	234	29.37	29.95	−.03	68.2	+1.6	88	20	77	47	4	60	27	62	59	76	5.98	+2.3	17	7,625	s.	58	nw.	9	5	10	16	7.0	.0	.0
Evansville	431	76	116	29.46	29.92	−.05	68.6	+1.9	89	20	77	47	3	61	25	62	58	73	6.75	+2.9	19	7,100	s.	30	sw.	5	6	9	16	6.5	.0	.0
Indianapolis	822	194	230	29.05	29.93	−.04	64.9	+2.0	86	24	73	41	4	57	25	58	54	72	7.10	+3.2	21	8,139	s.	34	w.	27	2	11	18	7.5	.0	.0
Terre Haute	575	96	129	29.30	29.91	----	66.2	----	88	20	75	43	3	58	28	60	57	76	7.93	+4.1	16	7,127	s.	29	w.	13	7	11	13	6.5	.0	.0
Cincinnati	627	11	51	29.27	29.94	−.05	66.2	+3.1	87	24	76	42	4	57	30	60	57	77	8.81	+5.1	19	5,618	sw.	29	sw.	13	3	8	20	7.3	.0	.0
Columbus	822	216	230	29.08	29.94	−.04	64.7	+2.4	85	26	73	42	3	56	26	58	54	73	6.95	+3.4	15	7,939	s.	33	s.	9	4	12	15	6.6	.0	.0
Dayton	899	137	173	28.99	29.93	----	65.1	+2.5	85	26	74	42	4	57	29	59	55	75	7.96	+4.4	18	6,673	sw.	30	w.	9	6	18	7	6.3	.0	.0
Elkins	1,947	59	67	27.97	29.98	−.02	62.6	+3.4	84	24	73	41	18	52	36	57	54	78	9.18	+5.1	23	4,611	w.	30	nw.	9	1	7	23	8.1	.0	.0
Parkersburg	637	77	82	29.32	29.98	−.01	67.0	+3.2	88	24	76	45	4	58	35	60	57	74	7.50	+4.1	18	4,595	sw.	25	w.	24	2	15	14	6.9	.0	.0
Pittsburgh	842	353	410	29.06	29.96	−.03	63.5	+1.1	85	26	72	44	4	55	30	57	52	71	6.55	+3.3	17	6,897	sw.	34	sw.	2	2	11	18	7.8	.0	.0
Lower Lake Region							59.8	+2.4										71	3.76	+0.5										6.7		
Buffalo	767	243	280	29.11	29.94	−.03	56.0	+1.4	80	26	63	37	4	49	25	51	47	75	3.00	−.1	12	9,271	sw.	42	sw.	13	4	13	14	6.9	.0	.0
Canton	448	10	61	29.44	29.92	----	57.2	+1.0	80	1	68	30	5	47	34	----	----	----	5.24	+2.2	15	6,252	sw.	35	sw.	13	8	11	12	5.8	.0	.0
Ithaca	836	74	100	29.05	29.94	----	60.6	+3.1	86	20	71	32	5	50	38	54	49	68	2.63	−.8	11	6,522	nw.	27	s.	2	5	6	20	7.6	.0	.0
Oswego	335	71	85	29.58	29.94	−.03	57.2	+2.0	80	2	66	36	5	48	28	52	47	71	2.24	−.8	14	6,418	w.	24	se.	24	5	7	19	6.9	.0	.0
Rochester	523	86	102	29.39	29.95	−.02	60.3	+3.2	81	19	69	39	5	51	29	53	47	65	2.17	−.8	11	5,963	sw.	32	sw.	13	4	17	10	6.4	.0	.0
Syracuse	596	65	79	29.32	29.96	−.02	61.0	+3.7	84	2	71	36	5	52	32	----	----	----	3.17	+.2	15	5,347	s.	21	sw.	13	7	13	11	6.4	.0	.0
Erie	714	130	166	29.18	29.94	−.04	59.7	+2.9	82	1	68	39	4	52	26	54	51	74	2.35	−1.0	15	8,383	w.	35	sw.	26	6	10	15	6.7	.0	.0
Cleveland	762	267	337	29.12	29.94	−.04	60.8	+2.9	84	1	68	39	3	53	28	54	49	71	2.86	−.3	15	8,975	w.	41	sw.	24	4	11	16	7.3	.0	.0
Sandusky	629	5	67	29.25	29.93	−.05	62.0	+2.8	88	24	71	41	4	53	27	----	----	----	5.24	+2.1	15	6,479	sw.	27	sw.	24	2	15	14	6.9	.0	.0
Toledo	628	79	87	29.26	29.93	−.04	61.3	+1.9	86	24	69	36	4	54	28	55	51	73	5.88	+2.4	16	6,977	e.	24	nw.	20	10	12	9	5.6	.0	.0
Fort Wayne	857	69	84	29.00	29.92	----	61.4	+1.2	84	23	69	36	4	54	30	56	53	74	7.06	+3.2	16	6,583	ne.	28	sw.	13	4	11	16	7.1	.0	.0
Detroit	730	218	258	29.16	29.95	−.02	60.2	+2.2	87	24	68	36	4	52	28	54	49	71	3.29	+.1	15	7,296	sw.	29	sw.	13	3	13	15	7.0	.0	.0
Upper Lake Region							54.6	+1.9										73	3.95	+0.8										6.3		
Alpena	609	13	89	29.29	29.96	−.01	52.6	+2.1	85	24	61	33	4	44	34	47	43	72	3.51	+.5	12	8,039	se.	34	w.	13	10	13	8	5.2	.0	.0
Escanaba	612	54	60	29.28	29.94	−.03	51.8	+2.2	79	24	59	32	4	44	26	47	42	71	2.39	−.5	10	7,923	s.	31	n.	2	6	14	11	6.0	.0	.0
Grand Haven	632	54	89	29.23	29.91	−.05	55.4	+.9	84	23	63	35	4	47	30	51	48	78	5.04	+1.8	17	7,823	e.	32	s.	1	4	13	14	6.9	.0	.0
Grand Rapids	707	70	244	29.16	29.93	−.04	59.7	+1.7	85	23	69	38	4	50	29	54	49	72	5.31	+1.9	18	9,027	e.	41	w.	1	3	17	11	6.7	.0	.0
Houghton	668	64	99	29.20	29.93	−.04	51.6	+2.1	81	23	61	30	3	42	32	----	----	----	1.28	−1.8	6	7,260	e.	33	e.	8	10	7	14	6.0	.0	.0
Lansing	878	6	88	28.99	29.93	----	58.1	+1.2	81	24	68	32	4	49	30	54	52	82	3.95	+.5	17	6,887	s.	25	sw.	1	6	13	12	6.2	.0	.0
Ludington	637	60	66	29.22	29.92	----	54.6	+2.4	81	23	63	32	4	46	30	50	46	76	5.88	+2.9	14	7,010	sw.	26	sw.	29	10	12	9	5.3	T	.0
Marquette	734	77	111	29.14	29.95	−.02	50.6	+1.6	83	25	59	30	4	42	37	45	39	67	2.08	−.9	8	6,565	nw.	34	sw.	13	5	12	14	6.6	.0	.0
Port Huron	638	79	120	29.24	29.94	−.03	56.2	+1.0	86	24	64	37	5	48	28	51	47	74	3.88	+.9	14	7,783	n.	30	w.	13	5	10	16	7.0	.0	.0
Sault Sainte Marie	614	11	52	29.27	29.97	+.02	52.2	+3.2	81	25	63	29	4	41	38	45	30	66	2.85	−.2	8	5,815	se.	30	nw.	13	10	9	12	5.6	.0	.0
Chicago	673	7	131	29.18	29.91	−.05	60.0	+2.5	86	23	67	40	3	53	27	54	50	76	5.03	+1.5	18	8,067	e.	35	sw.	12	4	15	12	6.8	.0	.0
Green Bay	617	109	141	29.24	29.90	−.05	57.2	+2.3	83	25	66	33	10	48	28	51	46	70	2.40	−1.1	11	8,965	ne.	35	ne.	2	3	12	16	7.1	T	.0
Milwaukee	681	97	221	29.17	29.91	−.05	55.1	+1.0	83	25	62	37	9	48	36	50	47	76	9.56	+6.2	16	10,081	n.	43	n.	2	5	12	14	6.8	.0	.0
Duluth	1,133	5	47	28.69	29.91	−.05	49.6	+2.3	76	25	59	29	10	40	33	44	39	71	2.15	−1.1	10	9,282	ne.	41	w.	13	9	7	15	6.2	.6	.0
North Dakota							55.6	+1.6										63	2.51	+0.2										6.4		
Moorhead	940	50	58	28.85	29.86	−.08	56.8	+1.7	87	17	67	32	9	46	39	49	42	63	1.93	−1.0	9	6,840	s.	26	e.	22	7	6	18	7.0	.0	.0
Bismarck	1,674	8	57	28.08	29.85	−.07	55.6	+1.1	91	31	66	30	2	45	38	48	41	62	2.38	+.1	8	7,527	se.	28	w.	24	4	13	14	6.8	.0	.0
Devils Lake	1,478	11	44	28.30	29.86	−.08	55.0	+2.4	85	31	66	29	9	44	38	47	39	62	2.22	+.2	10	7,546	se.	31	e.	8	7	9	15	6.8	.0	.0
Ellendale	1,457	10	56	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Grand Forks	833	12	67	----	----	----	57.1	----	88	17	69	28	2	45	44	49	----	----	2.81	----	9	----	nw.	31	se.	23	3	13	15	----	.0	.0
Williston	1,878	41	48	27.89	29.86	−.07	55.2	+1.2	93	31	66	31	10	45	33	47	41	65	3.52	+1.5	11	7,156	se.	31	nw.	23	11	11	9	5.2	.0	.0
Upper Mississippi Valley							62.4	+0.9										75	6.80	+2.8										6.8		
Minneapolis	918	102	208	28.88	29.85	----	58.8	+1.1	84	17	68	34	3	49	27	----	----	----	7.87	+4.2	11	9,148	e.	37	e.	7	5	9	17	7.1	.0	.0
St. Paul	837	114	149	28.96	29.86	−.08	59.1	+1.2	84	17	68	36	8	50	28	----	----	----	7.75	+4.5	12	7,478	se.	35	sw.	23	7	9	15	6.7	.0	.0
La Crosse	714	11	48	29.10	29.86	−.08	59.9	+.6	87	19	70	36	4	50	30	53	48	71	4.43	+.7	16	4,373	se.	17	e.	7	4	10	17	7.3	.0	.0
Madison	974	70	78	28.85	29.89	−.07	57.9	+.3	84	19	66	33	4	50	25	52	48	75	9.35	+5.5	18	7,285	ne.	30	ne.	1	3	11	17	7.1	.0	.0
Wausau	1,247	4	62	28.57	29.89	----	57.2	----	85	19	68	30	10	47	32	----	----	----	2.60	−1.1	12	6,028	e.	26	e.	7	8	12	11	5.5	.1	.0
Charles City	1,015	10	51	28.80	29.87	−.07	59.0	+1.2	83	23	69	35	3	49	30	52	48	71	3.95	−.4	12	5,907	se.	30	sw.	23	7	9	15	6.5	.0	.0
Davenport	606	118	143	29.23	29.88	−.07	62.2	+.9	84	23	71	36	4	54	27	56	52	72	6.31	+2.4	21	8,433	ne.	38	s.	12	2	14	15	7.1	.0	.0
Des Moines	861	5	99	28.96	29.86	−.07	61.8	+.5	87	19	71	40	4	53	30	55	50	69	2.65	−1.9	16	7,648	se.	35	s.	23	3	14	14	6.8	.0	.0
Dubuque	700	81	96	29.13	29.88	−.07	60.7	+.4	84	25	69	36	4	53	26	54	50	73	7.24	+3.0	18	5,637	s.	28	nw.	19	3	13	15	7.2	.0	.0
Keokuk	614	64	78	29.21	29.88	−.06	63.7	−.1	87	20	72	38	4	55	30	58	54	74	8.43	+4.5	16	5,982	sw.	26	sw.	12	5	7	19	7.2	.0	.0
Cairo	358	87	93	29.52	29.90	−.06	70.3	+1.9	88	20	78	51	3	63	25	66	64	84	9.02	+5.3	19	6,430	s.	40	se.	7	5	8	18	6.8	.0	.0
Peoria	609	11	45	29.24	29.90	−.06	62.8	+1.1	86	23	72	37	4	54	28	58	55	80	7.97	+3.9	19	5,284	s.	27	sw.	1	5	12	14	6.7	.0	.0
Springfield, Ill.	636	5	191	29.21	29.88	−.07	65.2	+2.0	88	23	74	38	4	56	27	59	57	78	8.69	+4.3	18	8,447	s.	41	sw.	20	6	7	18	7.1	.0	.0
Hannibal	534	74	109	29.29	29.86	−.08	65.3	+1.7	88	19	74	44	4	57	29	----	----	----	7.08	+2.7	14	6,963	sw.	40	sw.	1	6	5	20	7.1	.0	.0
St. Louis	568	265	303	29.28	29.88	−.07	67.2	+.3	93	20	76	45	3	58	32	61	59	78	8.59	+4.2	16	9,345	s.	50	s.	1	8	8	15	6.1	.0	.0
Missouri Valley							61.9	+0.4										67	3.53	−0.4										5.6		
Columbia, Mo.	784	6	84	29.03	29.86	−0.08	65.4	+1.1	89	19	74	42	6	56	31	----	----	----	7.30	+2.8	14	6,212	s.	32	sw.	1	9	14	8	4.8	.0	.0
Kansas City	963	10	86	28.83	29.85	−.07	65.4	+.6	90	19	74	43	6	57	29	58	53	68	6.94	+2.3	12	7,372	sw.	38	sw.	7	11	8	12	5.6	.0	.0
St. Joseph	967	11	49	28.82	29.85	----	64.2	----	90	19	74	41	6	55	29	56	52	70	3.49	−.8	14	6,496	se.	30	s.	17	12	9	10	5.3	.0	.0
Springfield, Mo.	1,324	98	104	28.49	29.87	−.06	65.8	+1.3	87	19	75	44	2	57	32	60	56	74	6.79	+1.6	11	7,607	s.	29	w.	1	15	9	7	3.9	.0	.0
Iola	984	11	50	28.80	29.82	−.10	67.5	+2.3	89	20	79	42	6	56	42	----	----	----	5.18	+.5	9	----	s.	----	----	----	11	7	13	----	.0	.0
Topeka	987	92	107	----	----	----	65.3	+1.0	93	19	76	44	3	55	36	----	----	----	2.55	−1.9	12	7,158	s.	26	sw.	18	14	7	10	4.9	.0	.0
Lincoln	1,189	11	81	28.59	29.84	−.07	61.2	−.5	93	19	71	39	6	51	38	54	49	68	1.58	−2.5	8	7,626	s.	35	sw.	23	9	8	14	6.2	.0	.0
Omaha	1,105	115	122	28.69	29.85	−.07	62.0	−.4	92	19	71	40	6	53	31	54	47	62	.73	−3.0	8	6,552	nw.	30	nw.	28	11	8	12	5.7	.0	.0
Valentine	2,598	47	54	27.18	29.88	−.02	55.3	−.9	92	31	66	32	10	45	39	48	42	69	4.74	+1.9	14	7,764	w.	56	sw.	22	6	10	15	6.5	.3	.0
Sioux City	1,135	94	164	28.64	29.84	−.08	60.4	.0	90	18	70	36	6	50	33	52	45	64	1.51	−2.5	8	8,992	nw.	41	s.	22	6	10	15	6.8	.0	.0
Huron	1,306	59	74	28.47	29.86	−.06	57.4	+1.0	91	18	68	35	9	47	41	51	45	67	1.55	−1.4	13	7,940	w.	38	w.	24	13	8	10	5.2	.0	.0
Pierre	1,572	70	75	28.19	29.85	−.06	57.6	−.4	94	31	68	34	9	48	39	50	43	64	2.16	−.3	12	7,482	nw.	50	s.	22	8	10	13	6.3	T	.0
Yankton	1,233	49	57	28.55	29.86	−.06	59.4	.0	91	31	69	36	6	50	37	----	----	----	1.38	−2.5	9	6,893	w.	30	s.	23	6	10	15	6.3	.0	.0

TABLE 1.—*Climatological data for Weather Bureau stations, May 1933*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Total movement	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*		*°F.*	*°F.*		*°F.*	*°F.*	*°F.*	*°F.*	*%*	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
Northern Slope							51.2	−1.5										62	2.81	+0.4										5.9		
Billings	3,140	5					54.8		94	30	69	30	12	40	53				2.63		12		nw.				7	9	15		0.0	0.0
Havre	2,505	11	67	27.25	29.86	−0.04	54.4	+1.0	92	30	66	32	10	43	42	45	37	60	2.26	+0.2	13	6,901	sw.	27	w.	15	6	12	13	6.3	.0	.0
Helena	4,124	89	113	25.71	29.88	−.05	49.6	−2.0	87	30	60	30	7	39	39	41	32	58	1.41	−.9	11	7,319	sw.	31	sw.	16	2	16	13	6.9	.2	.0
Kalispell	2,973	48	56	26.87	29.92	+.04	48.9	−2.5	78	29	60	30	7	38	43	39	39	72	2.51	+1.0	12	4,999	w.	22	w.	25	5	16	10	5.8	7.4	.0
Miles City	2,371	48	55	27.36	29.89	−.02	55.8	−.9	92	30	66	36	9	46	36	47	40	62	1.69	−.6	17	5,787	se.	34	nw.	23	11	12	8	5.5	.0	.0
Rapid City	3,259	50	58	26.50	29.90	.00	53.0	−1.0	92	31	62	33	10	44	41	46	40	66	6.51	+3.0	17	6,835	w.	34	nw.	23	7	10	14	6.1	T	.0
Cheyenne	6,088	84	101	23.91	29.84	−.01	48.3	−2.0	81	31	59	28	12	38	39	40	31	59	3.44	+1.0	12	9,070	w.	51	w.	22	5	16	10	6.4	16.9	.0
Lander	5,372	60	68	24.54	29.85	−.03	49.8	−1.4	85	31	62	25	13	38	42	40	31	57	3.78	+1.5	8	4,798	sw.	33	sw.	31	14	12	5	4.0	29.5	.0
Sheridan	3,790	10	47	25.99	29.86		51.6		90	31	64	30	13	40	46	44	37	64	2.75	+.1	14	5,313	nw.	31	nw.	23	10	10	11	5.7	.2	.0
Yellowstone Park	6,241	11	48		29.90	−.01	43.2	−4.2	77	30	54	22	12	32	39			61	1.15	−1.1	12	6,493	sw.	32	sw.	26	3	12	16		1.5	.0
North Platte	2,821	11	51	26.94	29.84	−.04	57.8	−.9	90	18	69	36	8	46	43	49	42	66	2.61	−.2	10	6,575	e.	35	w.	23	8	10	13	6.2	.0	.0
Middle Slope							63.3	+0.8											562.64	−0.7										4.7		
Denver	5,292	106	113	24.62	29.82	−.02	55.2	−1.0	86	31	66	32	11	45	32	43	30	49	2.34	+.1	9	6,343	s.	38	w.	22	9	13	9	5.4	3.2	.0
Pueblo	4,685	80	86	25.17	29.79	−.04	59.0	−.2	89	19	71	38	5	47	38	45	30	43	2.55	+1.0	3	6,254	e.	41	w.	22	15	11	5	4.6	.0	.0
Concordia	1,392	50	58	28.41	29.86	−.05	63.0	−.2	99	19	73	43	6	53	35	55	48	63	1.55	−2.6	8	6,900	n.	28	nw.	7	7	12	12	5.9	.0	.0
Dodge City	2,509	10	86	27.27	29.83	−.04	64.2	+.7	98	19	77	39	2	52	37	53	44	58	3.16	+.3	11	9,668	s.	49	se.	22	17	10	4	3.8	.0	.0
Wichita	1,358	85	93	28.41	29.82	−.08	67.8	+2.7	97	19	78	40	2	57	34	57	50	60	2.29	−2.2	7	8,730	s.	38	sw.	22	12	10	9	4.8	.0	.0
Oklahoma City	1,214	10	47	28.56	29.82	−.07	70.7	+3.0	93	10	81	46	2	61	33	61	56	66	3.98	−.9	9	7,650	s.	31	s.	11	15	11	5	4.1	.0	.0
Southern Slope							72.0	+1.3											482.78	0.0												
Abilene	1,738	10	52	28.04	29.81	−.06	74.4	+2.4	98	11	86	48	5	62	37	62	53	57	7.85	+3.9	7	7,818	s.	32	se.	3	16	9	6	4.0	.0	.0
Amarillo	3,676	10	49	26.14	29.80	−.04	66.5	+2.4	95	19	80	40	5	53	39	51	38	47	2.01	−.8	7	8,429	s.	37	ne.	20	17	13	1	3.0	.0	.0
Big Spring	2,537	5	62	27.24	29.80		73.0		97	22	88	42	5	58	41	57	45	46	.46		3		s.				16	12	3	3.3	.0	.0
Del Rio	944	64	71	28.79	29.74	−.11	80.0	+3.0	102	8	92	55	5	68	41	66	58	56	.29	−2.6	5	7,753	se.	40	se.	23	13	11	7	4.6	.0	.0
Roswell	3,566	75	85	26.24	29.78	−.04	66.9	−2.5	95	19	83	37	5	51	46	49	32	35	.50	−.6	3	7,564	sw.	32	sw.	6	23	7	1	2.1	.0	.0
Southern Plateau							62.4	−2.9											330.21	−0.2										2.1		
El Paso	3,778	152	175	26.07	29.77	−.01	70.6	−.9	96	31	84	44	13	57	36	49	24	22	.04	−.3	2	9,567	w.	44	w.	4	27	4	0	1.3	.0	.0
Albuquerque	4,972	51	66	24.94	29.74		59.8		89	27	76	33	15	43	45	42	22	30	.23		2	8,415	w.	49	w.	22	16	13	2	3.4	.0	.0
Santa Fe	7,013	38	53	23.17	29.77	−.04	53.5	−2.2	78	31	66	29	14	41	31	39	22	35	.99	−.3	4	5,770	sw.	30	sw.	6	15	13	3	3.5	2.8	.0
Flagstaff	6,907	10	59	23.27	29.80	+.02	46.0	−4.7	79	30	61	16	11	31	44	35		52	.66		6	7,534	sw.	33	sw.	9	8	19	4		T	.0
Phoenix	1,108	10	107	28.67	29.81	+.03	72.6	−2.4	107	29	88	49	12	58	40	51	30	26	T.	−.1	0	5,240	w.	35	sw.	21	29	2	0	.7	.0	.0
Yuma	141	9	54	29.69	29.84	+.05	72.9	−3.3	106	29	89	45	11	57	41	54	37	35	.01	.0	1	5,660	w.	35	sw.	21	29	2	0	.7	.0	.0
Independence	3,957	6	27	25.90	29.90	+.06	59.0	−4.0	93	29	74	33	12	44	37	42			.00	−.2	0		nw.				23	4	4		.0	.0
Middle Plateau							51.9	−4.0											471.22	+0.2										4.9		
Reno	4,532	74	81	25.42	29.93	+.02	50.1	−3.5	89	29	62	27	3	38	41	39	28	47	.66	.0	6	6,899	w.	32	sw.	16	11	15	5	4.8	0.1	0.0
Tonopah	6,090	12	20				49.3		82	30	60	22	3	38	29	37	24	43	.24		3		nw.									
Winnemucca	4,344	18	56	25.55	29.93	+.02	50.1	−3.8	91	29	64	27	9	36	51	38	27	50	.50	−.4	4	6,258	sw.	40	w.	7	10	13	8	5.2	.2	.0
Modena	5,473	10	46	24.51	29.82	.00	49.0	−4.5	86	30	64	24	1	34	45	37	24	48	1.13	+.3	10	8,096	sw.	43	sw.	7	12	9	10	5.0	4.3	.0
Salt Lake City	4,360	163	203	25.52	29.86	.00	53.1	−4.3	89	30	64	33	9	42	36	43	32	52	3.25	+1.3	13	6,159	nw.	29	nw.	7	10	10	11	5.4	.3	.0
Grand Junction	4,602	60	68	25.25	29.79	−.04	57.4	−3.7	89	30	70	35	23	45	36	43	27	40	.54	−.3	10	5,726	se.	32	s.	5	11	13	7	4.3	T	.0
Northern Plateau							53.3	−3.3										56	1.40	0.0										6.0		
Baker	3,471	48	53	26.39	29.98	+.02	47.6	−4.1	83	29	59	29	6	37	39	40	33	63	1.59	.0	14	5,287	se.	21	n.	23	8	13	10	5.7	1.2	.0
Boise	2,739	79	87	27.09	29.94	.00	54.0	−3.1	90	30	65	31	8	43	39	44	34	53	1.54	+.1	9	4,783	nw.	21	nw.	2	9	10	12	5.7	.1	.0
Lewiston	757	40	48	29.16	29.97	+.01	56.6	−2.9	92	25	68	36	6	45	41				1.50	−.1	10	3,395	e.	28	nw.	25	5	11	15	6.7	.0	.0
Pocatello	4,477	60	68	25.38	29.88	−.01	51.0	−2.8	86	30	62	29	9	40	38	40	30	54	1.46	−.1	13	6,934	se.	31	sw.	15	8	11	12	5.8	1.0	.0
Spokane	1,929	101	110	29.90	29.95	−.01	52.5	−3.0	86	25	63	36	19	42	36	43	34	57	.59	−.8	7	5,836	s.	25	w.	25	6	12	13	6.4	T	.0
Walla Walla	991	57	65	28.90	29.97	+.01	56.2	−3.4	86	29	66	36	7	46	31	47	37	54	2.13	+.5	13	4,669	s.	21	w.	25	9	11	11	5.6	.0	.0
Yakima	1,076	58	67	28.80	29.95		54.9	−4.1	82	28	66	33	3	44	34	45	35	54	1.08	+.4	11	5,193	nw.	23	w.	25	5	16	10	6.2	.0	.0
North Pacific Coast Region							51.6	−2.1										74	2.99	+0.8										7.8		
North Head	211	11	56	29.80	30.03	.00	48.8	−2.1	60	24	52	39	7	45	13	46	44	85	5.27	+2.3	22	11,067	s.	49	s.	6	1	11	19	7.5	.0	.0
Port Angeles	20	8	53		30.02		49.2		63	28	56	35	6	43	21				1.45	+.3	15	5,058	s.	26	w.	25	1	10	20		.0	.0
Seattle	125	215	250	29.86	29.99	−.02	53.4	−1.1	73	28	60	43	5	47	24	47	41	68	2.63	+.8	12	7,238	s.	32	s.	25	1	12	18	7.6	.0	.0
Tacoma	194	172	201	29.82	30.03	+.01	52.4	−1.7	77	28	60	40	5	45	30				2.84	+.7	16	6,291	sw.	27	w.	17	0	13	18	7.9	.0	.0
Tatoosh Island	86	9	53	29.90	29.99	−.02	48.8	−.8	59	19	52	41	5	46	15	46	43	84	3.61	−.4	23	8,373	sw.	33	s.	19	0	5	26	8.7	.0	.0
Medford	1,329	29	58	28.61	30.02		51.8		89	28	63	32	6	40	45	45	39	69	1.41	+.2	14	5,199	nw.	29	se.	1	7	1	23	7.2	.0	.0
Portland, Oreg	153	68	106	29.87	30.03	.00	53.9	−3.0	80	28	61	43	7	47	28	48	43	70	3.59	+1.4	20	5,031	s.	21	sw.	19	2	1	28	8.4	.0	.0
Roseburg	510	75	99	29.50	30.06	+.03	52.2	−3.8	84	28	61	36	18	43	38	46	41	70	3.15	+1.2	19	4,328	n.	23	s.	6	3	8	20	7.3	.0	.0
Middle Pacific Coast Region							57.1	−2.7										69	1.42	+0.4										4.9		
Eureka	62	73	89	30.06	30.13	+.08	51.0	−1.0	64	24	55	41	9	47	15	49	47	89	4.23	+2.4	16	6,791	n.	26	se.	6	3	7	21	7.4	.0	.0
Red Bluff	330	5	58	29.63	29.98	+.03	63.0	−3.3	104	28	76	40	6	51	35	51	40	53	.86	−.3	9	5,582	se.	25	se.	1	10	8	13	5.3	.0	.0
Sacramento	69	106	117	29.93	30.00	+.06	59.6	−3.7	100	28	72	39	6	48	38	50	42	60	.30	−.5	4	6,690	s.	21	sw.	20	22	7	2	2.8	.0	.0
San Francisco	155	208	243	29.89	30.06	+.07	55.2	−1.6	85	27	61	47	14	49	30	49	45	74	1.36	+.6	7	7,455	w.	28	nw.	21	13	11	7	4.5	.0	.0
San Jose	141	12	110	29.93	30.08		56.6	−4.1	91	28	67	39	8	46	42				.37	−.2	6	5,750	nw.	24	nw.	2	13	10	8	4.6	.0	.0
South Pacific Coast Region							60.5	−2.9										64	0.36	0.0										4.0		
Fresno	327	89	98	29.64	30.00	+.08	62.8	−4.3	103	29	76	39	8	50	37	51	39	51	.34	−.1	6	7,389	nw.	23	nw.	9	15	11	5	3.8	.0	.0
Los Angeles	338	159	191	29.64	30.00	+.05	60.4	−1.8	85	24	69	45	11	52	28	52	46	66	.21	−.2	2	4,910	sw.	21	nw.	2	16	12	3	3.5	.0	.0
San Diego	87	62	70	29.91	30.00	+.05	58.2	−2.6	74	24	64	48	10	53	19	53	49	76	.53	+.2	6	5,512	w.	22	w.	21	13	10	8	4.7	.0	.0
West Indies																																
San Juan, P. R	82	9	54	29.89	29.98		79.4	+.8	90	4	84	71	1	75	16				10.35	+5.1	14	8,778	e.	27	ne.	28	4	17	10	6.1	.0	.0
Panama Canal																																
Balboa Heights	118	6	97		[1] 29.83	+.01	80.4	−.3	94	1	86	71	2	75	22			[1] 85	7.96	.0	16	4,001	nw.	32	s.	13	1	13	17	7.3	.0	.0
Cristobal	36	6	97		[1] 29.84	.00	82.4	+1.7	92	4	88	74	10	77	16	76	75	[1] 81	8.12	−4.4	14	4,758	se.	27	ne.	12	3	11	17	7.4	.0	.0
Alaska																																
Fairbanks	455	11	44	[2] 29.32	[2] 29.83		46.3		76	26	57	26	22	36	35	39	30	59	.82	+.2	11	4,155	s.	22	ne.	28	6	5	20	7.1	T	.0
Juneau	80	11	50	[2] 29.79	[2] 29.88		48.2		69	25	56	35	6	40	28	43	37	70	4.65		16	4,462	s.	24	se.	20	4	7	20	7.4	.0	.0
Hawaiian Islands																																
Honolulu	38	86	100	[2] 30.05	[2] 30.09		73.8	−1.0	80	14	78	67	13	70	11	67	63	70	.58	−1.2	11	7,626	e.	27	e.	21	11	17	3	4.7	.0	.0

[1] Observations taken bihourly.

[2] Pressure not reduced to mean of 24 hours.

TABLE 2.—*Data furnished by the Canadian Meteorological Service, May 1933*

Stations	Altitude above mean sea level Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max. + mean min. ÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*° F.*	*° F.*	*° F.*	*° F.*	*° F.*	*° F.*	*In.*	*In.*	*In.*
Cape Race, N.F.	99							31.7		23	3.26		0.0
Sydney, C.B.I.	48	29.82	29.87	−0.10	46.7	+1.5	58.3	35.1	74	26	1.84	−1.93	.0
Halifax, N.S.	88	29.80	29.91	−.07	49.3	+.9	60.5	38.1	78	29	3.89	−.37	1.0
Yarmouth, N.S.	65	29.82	29.89	−.09	47.6	.0	54.9	40.4	71	32	3.87	+.30	T
Charlottetown, P.E.I.	38	29.80	29.84	−.12	47.6	+.7	56.7	38.6	71	30	1.67	−1.24	.0
Chatham, N.B.	28	29.75	29.78	−.17	48.6	+.1	61.1	36.0	80	28	2.31	−.90	.0
Father Point, Que.	20	29.84	29.86	−.07	44.6	+.6	53.2	35.9	67	28	3.80	+1.22	3.0
Quebec, Que.	296	29.58	29.90	−.04	52.3	+2.4	62.9	41.7	80	31	3.43	+.35	.0
Doucet, Que.	1,236				45.0		59.0	31.0	77	15	2.47		T
Montreal, Que.	187	29.69	29.89	−.05	57.1	+2.4	65.9	48.3	80	32	7.24	+4.34	.0
Ottawa, Ont.	236	29.66	29.92	−.02	56.3	+1.4	66.2	46.4	83	32	3.63	+1.04	.0
Kingston, Ont.	285	29.63	29.94	−.02	54.6	+1.7	63.1	46.1	78	34	1.22	−1.46	.0
Toronto, Ont.	379	29.53	29.93	−.05	57.4	+4.2	66.8	48.0	83	36	1.12	−1.92	.0
Cochrane, Ont.	930				47.3		59.7	35.0	80	17	1.93		.0
White River, Ont.	1,244	28.65	29.97	+.02	47.3	+1.6	59.9	34.6	77	18	2.25	+.30	.0
London, Ont.	808				56.2		65.9	46.5	84	32	1.94		.0
Southampton, Ont.	656	29.23	29.95	−.01	52.6	+1.9	62.1	43.0	76	31	4.04	+1.60	.0
Parry Sound, Ont.	688	29.24	29.94	+.01	53.9	+2.8	64.7	43.1	75	31	2.92	−.01	.0
Port Arthur, Ont.	644	29.24	29.95	−.01	49.3	+3.4	57.4	41.1	73	30	1.90	−.25	.0
Winnipeg, Man.	760	29.06	29.89	−.07	54.7	+3.1	67.0	42.4	84	27	5.27	+2.99	.0
Minnedosa, Man.	1,690	28.09	29.89	−.07	52.6	+4.2	64.5	40.7	85	27	3.46	+2.01	.0
Le Pas, Man.	860				49.8		62.5	37.2	78	26	.12		.0
Qu'Appelle, Sask.	2,115	27.60	29.83	−.11	52.6	+2.8	63.5	41.7	83	24	3.90	+2.25	.0
Moose Jaw, Sask.	1,759				53.8		65.2	42.5	88	30	5.22		.0
Swift Current, Sask.	2,392	27.30	29.80	−.12	53.4	+2.7	64.9	41.8	94	28	2.20	+.44	.0
Medicine Hat, Alb.	2,365	27.33	29.80	−.09	53.2	−.9	63.8	42.6	85	29	2.14	+.83	.0
Calgary, Alb.	3,540	26.17	29.83	−.05	48.5	−.5	58.9	38.0	74	29	2.08	+.31	4.4
Banff, Alb.	4,521												
Prince Albert, Sask.	1,450	28.36	29.93	−.02	53.5	+5.9	64.7	42.2	78	28	3.25	+1.99	.0
Battleford, Sask.	1,592	28.15	29.88	−.04	53.3	+2.3	65.0	41.7	87	27	1.43	−.19	.0
Edmonton, Alb.	2,150	27.59	29.86	−.02	51.8	+1.0	64.0	39.7	77	30	1.98	+.43	5.5
Kamloops, B.C.	1,262	28.57	29.85	−.04	54.9	−4.2	65.1	44.8	78	39	1.04	−.20	.0
Victoria, B.C.	230												
Barkerville, B.C.	4,180												
Estevan Point, B.C.	20				46.9		51.4	42.5	55	38	10.47		.0
Prince Rupert, B.C.	170				48.2		55.5	40.9	63	36	5.23		.0
Hamilton, Ber.	151	29.92	30.08	+.02	71.9	+2.5	77.0	66.7	83	62	2.74	−1.92	.0

LATE REPORTS FOR APRIL 1933

Qu'Appelle, Sask.	2,115	27.67	29.96	−.03	35.2	−2.2	44.5	25.9	69	8	2.10	+1.05	19.5
Swift Current, Sask.	2,392	27.38	29.93	−.03	39.0	−2.3	49.5	28.5	75	16	1.05	+.12	6.7
Battleford, Sask.	1,592	28.25	30.02	+.05	37.7	+.5	48.0	27.4	75	17	1.30	+.83	11.6
Edmonton, Alb.	2,150	27.68	29.99	+.10	38.6	−1.3	49.3	27.9	69	15	.72	−.16	3.9
Kamloops, B.C.	1,262	28.66	29.96	+.03	47.6	−1.3	58.6	36.6	75	26	.22	−.17	.0
Estevan Point, B.C.	20				44.6		50.1	39.0	60	30	4.50		.0
Prince Rupert, B.C.	170				41.9		48.7	35.1	56	29.	7.44		2.0
Hamilton, Ber.	151	29.86	30.02	−.03	66.5	+2.6	71.4	61.6	76	55	7.28	+3.10	.0

SEVERE LOCAL STORMS, MAY 1933

[Compiled by Mary O. Souder]

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path (yards)	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Salem, Ark., vicinity of, northeastward to the Missouri line.	1	1:30–2:30 p.m.	200–867	3	$30,000	2 tornadoes	17 persons injured; property damaged	Official, U.S. Weather Bureau.
Oregon County, Mo., Southwestern portion.	1	2:15 p.m.			70,000	Tornado	22 persons injured; damage to property and crops.	Do.
Aurora, Joliet, Payson, Camp Point, Baylis, Golden, Liberty, and Timewell, Ill.	1	2:30–4 p.m.			10,000	Hail	Poles down, buildings damaged	Do.
Carrollton, Greenfield, Roodhouse, White Hall and vicinity, Ill.	1	3 p.m.			5,000	Wind and hail	Poles and trees blown down; buildings damaged; minor garden losses.	Do.
Fulton and Peoria Counties, Ill.	1	3:30 p.m.	300	4	1,025,000	Tornado and hail	30 persons injured; property damaged; path 12 miles long.	Do.
Calhoun, Ark., 6 miles southeast.	1	4 p.m.	19	6	5,000	Tornado	2 persons injured; property damaged	Do.
Arcadia, La.	1	do	880	6	200,000	do	50 persons injured; 98 homes damaged and 60 demolished; path 5 miles long.	Do.
Minden, La., 4 miles west-southwest.	1	do	440–880	23	1,250,000	do	400 persons injured, and 1200 homeless; 500 or more homes destroyed; path 6 miles long.	Do.
Peru, La Salle, Tonica, Granville and vicinity, Ill.	1	4:45 p.m.			2,000	Wind and hail	Poles down and buildings damaged	Do.

SEVERE LOCAL STORMS, MAY 1933—Continued

Place	Date	Time	Width of path (yards)	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Herrin, to West Frankfort, Ill.	1	8 p.m.	[1] 1		$40,000	Wind	4 persons injured; trees uprooted; buildings unroofed.	Official, U.S. Weather Bureau.
Lake Village, Ark.	1	12 p.m.		3	50,000	Tornado	12 persons injured; property damaged	Do.
Clay, Tippecanoe, Carroll, and Cass Counties, Ind.	1	P.m.		1	25,000	Wind	Property damaged	Do.
Moline, Ill.	1				25,000	do	Damage to hangars, airport equipment, and plane.	Do.
Central and northern Illinois and Chicago.	1			4	500,000	Tornado	Scores injured; property damaged	Do.
Tangipahoa and Tammany Parishes, La.	1				50,000	Heavy hail	Loss to strawberry crop	Do.
Flint, Mich. (east of)	1–2	P.m.			50,000	Tornadic winds	Heavy damage along Dort Highway for about 9 miles; 2 persons injured; livestock killed; damage to buildings.	Do.
Lower peninsula and Livingston, Ionia, Gratiot, Barry, and Calhoun Counties, Mich.	1–2			1	4,000	Rain, wind, electrical.	Property damage and loss to livestock	Do.
Rock Hill (near), S.C.	2	P.m.		1		Thunderstorm	Man killed by lightning	Do.
Elliottville, N.Y.	2			1	22,000	Electrical, heavy rain.	Washout delayed train service; several places struck by lightning.	Do.
Sylvester - McCaulley, Tex.	3	4:30 p.m.	100		15,000	Tornado	Several houses demolished; poultry and livestock killed; path 150 yards long.	Do.
Abilene - Watsonville, Tex.	3	4:50 p.m.	100–440		10,250	do	Telephone poles and trees blown down; few houses destroyed; 2 persons injured; path 7 miles long.	Do.
Spur, Tex.	3		50		300	Tornado	2 small buildings damaged; window glass broken.	Do.
Houston (near) Tex.	4	10:30 a.m.			15,150	Hail	Window panes in many greenhouses broken	Do.
Endora, Ark.	4	4 p.m.			50,000	Tornado	Property damaged; path wide and 3 miles long	Do.
Bosco, La.	4	4:50 p.m.			25,000	Wind and hail	Several small houses destroyed	Do.
Tallulah, La., 2 miles east.	4	6:30 p.m.	500	1	35,000	Tornado	15 persons injured; considerable damage to timber; path 10 miles long.	Do.
Calico Rock, Ark.	4	p.m.			500	Tornado and hail	Property damaged; path narrow and 6 miles long.	Do.
Aledo-Leedey, Okla.	4	do			8,500	Heavy hail	Road between Leedy and Rhea blocked by hailstone drifts 4 feet deep; wheat and other crops destroyed; roofs and automobile tops damaged; path 11 miles long.	Do.
Edna-Demopolis, Ala.	5	12:30 a.m.	440	4	60,000	Tornado	30 persons injured; severe property damage; crop loss slight; path 35 miles long.	Do.
Brent, Coalmont and Helena, Ala.	5	2:30 a.m.	50–1,000	21	253,000	do	196 persons injured; damage to crops, timber, and property; path 70 miles long.	Do.
Anderson to Belton, S.C.	5	2:30 p.m.	100–500	19	350,000	do	100 persons injured; 60 families rendered homeless; path 45 miles long; greatest damage in Belton.	Do.
Jefferson County, Ala.	5	3 a.m.	100		4,000	do	1 person injured; property damaged	Do.
Chesterfield, S.C.	5	3–4 p.m.	880		20,000	Thundersquall	20 persons injured; 10 dwellings and 15 barns wrecked; path 8 miles long.	Do.
Chester, S. C. (10 miles southeast).	5				2,000	do	Damage mostly to farm buildings	Do.
Oktibbeha and Lee Counties, Miss.	6	1–2 a.m.			9,000	Tornadic winds	8 persons injured; property damaged	Do.
Cairo, Ill.	7	11:20 a.m.			6,550	Wind	Telephone and electric light poles blown down; smokestacks at the plants of the Cairo River and Rail Warehouse and the Missouri Cotton Oil Company blown down.	Do.
Plymouth, Ida, Calhoun, Webster, Humboldt, Wright, and Polk Counties, Iowa.	7	2 p.m.			35,000	Tornadoes	1 person injured; property damaged	Do.
Floyd (near) to Bald Knob, Ark.	7	3 p.m.			1,000	Tornado and hail	Damage to trees and buildings; path narrow	Do.
Harrisburg (8 miles north of), to Truman, Ark.	7	4 p.m.	433		25,000	do	3 persons injured; property damaged	Do.
Covington (near), Tenn.	7	4:36 p.m.		6	75,000	Tornado	20 persons injured; damage to farmhouses and buildings.	Do.
Luverne, Iowa	7	5:30 p.m.			500	do	Elevator blown down and several small buildings destroyed.	Do.
Fairfax-Walterboro, S.C.	7	10–11:30 p.m.	[1] 5		88,000	Thundersquall and hail.	Buildings and crops damaged; path 30 miles long.	Do.
Southern Craighead and northern Poinsett Counties, Ark.	7					Wind	Considerable damage to fruit trees, crops, and buildings.	Do.
Judsonia, Ark.	7				2,000	do	Loss to strawberry crop	Do.
Newman, Griffin, and Jackson, Ga., and vicinity.	7	P.m.	[1] 7		50,000	Rain and hail	Damage to crops and buildings; several washouts occurred.	Do.
Bondurant - Maxwell, Iowa.	7		200		3,000	Tornado	Path 12 miles long; no other details	Do.
Eagle Grove, Iowa.	7				5,000	do	Barn and other farm buildings destroyed; 500 chickens killed.	Do.
Choteau County, Mont.	7			1		Severe blizzard	Large loss to livestock, especially sheep in eastern districts.	Do.
Sycamore and Cloverdale, Ga.	8		34			Tornadic winds	Property damaged	Do.
Springfield, Ill.	9	4:45–6:13 a.m.	[1] 2–3		50,000	Electrical and hail.	Damage to greenhouses and automobile tops, little damage to trees and vegetation; path 9 miles long.	Do.
Dayton, Ohio, 1 mile northeast.	9	6:37 a.m.	440–880		1,000,000	Tornado	Damage to wires, poles and cables; trees uprooted; many persons injured; hundreds homeless; path 2 miles long.	Do.
Versailles and Rising Sun, Ind.	9	5:15–5:30 p.m.	150–300		10,000	do	Property damaged	Do.
Dale-Norris City, Ill.	9	6 p.m.	100–220	2	5,000	do	3 persons injured; property damaged; path 8 miles long.	
Monroe, Russell, Adair, and Metcalf Counties, Ky.	9	8:30 p.m.	250–1,780	36	245,000	do	87 persons injured; path 9 miles long	Do.
Lebanon near Tenn.	9	10:30 p.m.		2		do	6 persons injured; no details	Do.
Overton County, Tenn.	9	12 p.m.		33	100,000	do	100 persons injured; about 30 houses blown away; roads blocked by debris; chickens found with the feathers blown off.	Do.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, MAY 1933—Continued

Place	Date	Time	Width of path (yards)	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Warren, Tipton, Hamilton, Madison, Delaware, Randolph, and Wayne Counties, Ind.	9		[1] ½–1½		$88,500	Tornado	Property damages	Official, U.S. Weather Bureau.
Byrdstown, Tenn	9			2		do	Many persons injured; no details	Do.
Bryson City, Robbinsville, Forest City, Canton, and Ellenboro, N.C.	10	3:30–4:30 a.m.				Electrical; rain and wind.	Power and telephone wires disabled; houses flooded and otherwise damaged.	Do.
Ingold, N.C	10	8:30 a.m				Cyclonic wind	Trees uprooted and property damaged	Do.
Rushville-Browning, Ill	10	3:15 p.m	[1] 2½		10,000	Hail	No details; path 10 miles long	Do.
Brownwood (near) Tex	10	7:10 p.m	200	4	250,000	Tornado	7 persons injured; property damages; path 7 miles long.	Do.
North Carolina, southeastern portion.	10		[1] 1–5		60,000	Thundersqualls	10 persons injured; damage mostly from floods; path 20 miles long.	Do.
Waurika, Okla., vicinity of.	11	5 p.m	1,320		800	Hail	Loss to property and crops; path 2 miles long	Do.
Walker County, Ga	11	P.m				Hail and rain	Window panes broken; crops and gardens damaged considerably.	Do.
Bourbon County, Kans	12	1 p.m	440–880		15,000	Tornado	1 person seriously injured; some houses damaged; barns and outbuildings demolished; path 25–30 miles long.	Do.
Lone Oak-Needmore, Tenn.	12	do				do	1 person injured; small damage to farm buildings	Do.
Tulsa (near), Okla	12	5 p.m	220	5	15,000	do	5 persons killed in the collapse of a house; 11 persons injured as result of storm.	Do.
Centrahoma, Okla., and vicinity.	12	8:30 p.m	[1] 2			Hail	Much damage to crops; path 9 miles long	Do.
Baylis to Perry, Ill	12	11 p.m	440–880		10,000	Tornado	2 persons injured; property damaged; path 20 miles long.	Do.
Buffalo, N.Y., and vicinity.	12					Rain, electrical	Viaducts flooded causing delay of traffic and street car service; farm lands in western New York flooded.	Do.
Springfield, Mo	12–13					Rain and flood	Streams swollen; farm lands badly washed; traffic closed over numerous roads, widespread damage by local flooding.	Do.
Bentonville, Ark	13	4 a.m	333		6,000	Tornado	Property damage; path 5 miles long	Do.
Xenia, Ohio	13	5.30 a.m	440–880	1	50,000	Severe wind	Many persons injured; more than 75 houses demolished; path 2 miles long.	Do.
Cincinnati, Ohio, and vicinity.	13	A.m				Thundersquall, excessive rain.	Streets and basements flooded; debris carried down hillside by rushing waters obstructing traffic for several hours in many sections; truck gardens ruined; farm lands flooded.	Do.
Franklin, Ark	13	7:30 p.m	333	2	30,000	Tornado	12 persons injured; property damaged; path 3 miles long.	Do.
Pocahontas, Ark	13	9:10 p.m	433	2	10,000	do	14 persons injured; property damaged	Do.
Harrison, Ark	13					do	Electric wires blown down; considerable property damaged.	Do.
Naylor (near), Mo	13			1		do	A number of houses and farms destroyed; 4 persons injured.	Do.
Kuna, Idaho	15	6–7 p.m	1,760		8,000	Hail	Damage to crops, gardens, and fruit; path 4 miles long.	Do.
Monticello, Iowa	15					Rain and hail	Wagon bridge washed out; grades of 2 highway bridges, automobile tops, and skylights damaged.	Do.
Bath County, Ky	15		67–440		100,000	Tornadic winds	No details	Do.
Granville County, Northampton, N.C.	15				10,000	Hail and wind	Damage mainly to buildings	Do.
La Crosse, Wis. (3 miles south).	16	2:30 p.m			10,000	Hail	Damage to prospective fruit crop	Do.
Florence, Kans. (5 miles west).	17	7 p.m	[1] 3		6,500	Wind and hail	Small buildings wrecked or damaged; window panes broken and crops destroyed; path 3 miles long.	Do.
Shawnee County, Kans	17	3:30 p.m	880		200	Tornado	Telephone wires damaged; old barn and small buildings demolished.	Do.
Dickinson County, Kans	17	5–6 p.m	[1] 10		120,000	Wind and hail	Damage to crops, windows and automobiles; path 12 miles long.	Do.
Grangeville, Idaho (8 miles northwest).	17	6 p.m	100			Tornado and hail	Damage small, but not estimated; path 4 miles long.	Do.
Pottawatomie and Marshall Counties, Kans.	17	do	880		20,000	Tornado	Damage to telephone lines and farm buildings; path 11 miles long.	Do.
McPherson County, Kans.	17	6–8 p.m	[1] 10		100,000	Heavy hail	Large loss to crops in northern part of county; roofs, greenhouses, windows and automobiles damaged; path 30 miles long.	Do.
Fort Stockton, Tex., and vicinity.	17	7 p.m	[1] 4		10,000	Severe hail	Roofs, windows, trees and gardens damaged; path 5 miles long.	Do.
Lyon County, Kans	17	7:45 p.m	150		10,000	Tornado and thundersqualls.	Livestock killed and property damaged; path 4 miles long.	Do.
Williamsville-Broadwell, Ill.	17	8 p.m	[1] 4		12,000	Hail	Considerable loss to crops; damage to roofs and glass; path 12 miles long.	Do.
Reno County, Kans	17	9 p.m	[1] 10		70,000	do	Chief damage to orchards and gardens; path 20 miles long.	Do.
Jefferson, Iowa	17				1,000	do	Glass and automobile tops damaged	Do.
Kiro, Reserve, Morrill, and Seneca, Kans.	18	P.m				Tornado winds	Telephone lines down; several farm buildings destroyed; few persons injured.	Do.
Kandiyohi, Meeker, and McLeod Counties, Minn.	18					do	Several persons injured; property loss considerable.	Do.
Yellowstone County, Wyo.	18		[1] 2½		5,000	Heavy hail	Loss to poultry and gardens	Do.
Lapeer County, Mich	19	3 p.m	220		100,000	Tornado	Telephone and power lines, houses and barns damaged; 3 persons injured; 10 trees left standing in orchard of 70.	Do.
Eastman, Wis., and vicinity.	19	10:45 p.m	[1] 2–3		1,000	Heavy rain and wind.	Damage to buildings	Do.
Homer, Jewell, and Ellsworth, Iowa.	19				75,000	Tornado	3 foot bridges washed out; much damage to highways.	Do.
Milwaukee, Washington, Grant, Iowa, Crawford, Dane, and Green Counties, Wis.	19–20				29,000	Heavy rains and floods.	Property and crops damaged	Do.
Whitesville and King City, Mo.	20	2 p.m			10,000	Tornado	Property damaged	Do.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, MAY 1933—Continued

Place	Date	Time	Width of path (yards)	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Taylor, Ark.	20	4 p.m.				Tornado	Considerable damage to timber; path very narrow.	Official, U.S. Weather Bureau.
Reading, Pa., and vicinity.	20	5:30–6 p.m.	14		$750,000	do	6 persons seriously injured; large church badly damaged; many buildings unroofed; crop damage severe.	Do.
Adams, Pike, Green, Macoupin, and Montgomery Counties, Ill.	20	6–10 p.m.				Electrical and wind.	Wires and buildings damaged; 1 person injured.	Do.
Bison (near), Kans.	20	P.m.			2,000	Tornadic winds	Damage only to small buildings.	Do.
Berks, Bucks, Adams, York, and Northampton Counties, Pa.	20	do		2	1,000,000	Electrical and wind.	Lighting and telephone service crippled; trees uprooted, property damaged.	Do.
Western and southwestern Kansas.	20–21					Tornadoes	Property damaged.	Do.
Lake Alice, N.Mex.	22	8 a.m.–12:30 p.m.				Wind	Light and power lines damaged; crops blown out; many buildings unroofed.	Do.
Rapid City, S.Dak., and vicinity.	22	3:54–4:06 p.m.			50,000	Wind and hail	Poles blown down; windows broken; signs destroyed; roofs damaged.	Do.
Finney County, Kans.	22	4:25 p.m.	200		25,000	Tornado	Telephone lines and farm buildings damaged; 10 persons injured; path 20 miles long.	Do
Rochford, S.Dak., in the Black Hills (3–4 miles west).	22	5 p.m.	880			Tornado and hail	Telephone wires wrapped around poles; buildings destroyed; timbers levelled to ground; 8 persons injured; path 6 miles long.	Do.
Bison to Lemmon, S. Dak.	22	5:25 p.m.			4,200	Tornado	Damage estimated for Bison, elsewhere 1 barn and several small buildings destroyed.	Do.
Liberal and Dodge City, Kans.	22	5:25–6:55 p.m.		5	1,000,000	do	Telephone communication wrecked and business paralyzed; 150 persons injured; 1 person missing; many homes demolished; path 65 miles long.	Do.
North Platte, Nebr. (10 miles west).	22	5:30–6:30 p.m.	880		100,000	do	Several persons injured.	Do.
Bainville, Mont.	22	6–6:15 p.m.	120		50,000	do	30 persons injured; the principal business structures damaged or wrecked consisted of a cafe, hotel, filling stations, warehouses and grain elevators; little or no damages to residences.	Do.
Tryon, Nebr.	22	6:20 p.m.	1,250	8	40,000	do	10 persons injured.	Do.
Nebraska, central and western portions.	22	6–9 p.m.	[1] 200	2	200,000	High winds	Telephone and power poles and trees blown down; windmills, outbuildings and barns destroyed; poultry killed.	Do.
Smith County, Kans.	22	7:30–8 p.m.			100,000	Wind	Telephone service crippled; many farm buildings wrecked or blown away.	Do.
Rooks County, Kans.	22	7:40 p.m.			40,000	do	Many small buildings damaged or destroyed; oil derricks blown down.	Do.
Valentine, Nebr., and vicinity.	22	8–8:35 p.m.			25,000	Severe wind	Telephone and electric wires blown down; 2 airplanes and hangar completely demolished; barn blown away.	Do.
Pierre, S.Dak.	22	8:30 p.m.				Wind	Poles, trees, and fences blown down; windows broken; buildings damaged.	Do.
Eastern Colorado	22	P.m.				Gale and rain	Telephone and light poles blown down; scores of persons injured; tree uprooted; 15 empty freight cars derailed at Moffat, 23 miles west of Denver; amount of damage not estimated.	Do.
Rawlins, Kans.	22	do			10,000	Tornado	Buildings damages; path 21 miles long.	Do.
Sheridan, Graham, and Norton Counties, Kans.	22	do	[1] 20		13,000	Tornadic winds	Few residences and many farm buildings damaged; path 30 miles long.	Do.
Bainville, Mont.	22	do				Tornado	12 persons injured; 10 buildings damaged or demolished.	Do.
Yankton to Sioux Falls, S.Dak.	22–23	11 p.m.–1 a.m.		1		Wind	Poles, trees, a residence, several small buildings and a few barns blown down.	Do.
Beaver Creek watershed, Wibeaux County, Wyo.	22–23					Rain and flood	Numerous fields washed out; fences uprooted and scores of sheep drowned; loss not estimated.	Do.
Brown County, Kans.	23	1:10 a.m.	100		300	Tornadic winds	Wires blown down; farm buildings damaged; path 5 miles long.	Do.
Wisconsin Rapids, Wis. (10 miles southwest).	23	3:30 p.m.	300		75,000	Tornado	Path of greatest destruction 75–80 feet wide and 15 miles long; a farmer blown 100 feet and and slightly injured.	Do.
Western Wisconsin	23	P.m.			150,000	Tornadic winds	Roofs blown off, barns and outbuildings demolished; 1 person injured.	Do.
Des Moines, Iowa	23			1		Wind	Branch of tree fell, killing a child.	Do.
Black Hills Section, S.Dak.	23			1		Flood	Telephone and telegraph wires blown down; travel at standstill; 300 feet of railroad track washed out in vicinity of Deadwood; boy drowned.	Do.
Stanton County, Kans.	24	10 a.m.	440		500	Heavy hail	Only few growing crops or damage would have been greater; path 2 miles long.	Do.
Kearney County, Kans.	24	11 a.m.	[1] 2		1,000	do	Damage to crops; path 9 miles long.	Do.
Clovis, N.Mex.	24	2 p.m.	[1] 12			Hail	10 percent damage to wheat crop in vicinity.	Do.
Grant County, Kans.	24	2:30 p.m.	[1] 7		5,000	Heavy hail	Drifts of hailstones across highways reported a foot deep delaying traffic; small crop damage; path 14 miles long.	Do.
Camden and Moorestown, N.J.	24	4–6 p.m.			1,000,000	Tornadic winds	All power lines down; large trees uprooted and many buildings unroofed; large movie studio demolished; airplane damaged.	Do.
Philadelphia, Pa.	24	4:15–6:32 p.m.		6	50,000	Electrical and wind.	14 persons seriously injured; wire service crippled; windows broken and buildings damaged.	Do.
Pawnee and Hodgeman Counties, Kans.	24	P.m.			10,000	Heavy hail	Hailstones drifted 6 feet deep in places; all growing crops destroyed in path; about 45 head of cattle killed, partly by drowning and partly by freezing; path 9 miles long.	Do.
Corpus Christi (near), Tex.	25	12:30 p.m.				Tornado	Several small sailing vessels overturned and were sunk or damaged.	Do.
Newberry (near), S.C.	25	3 p.m.	440		1,100	Thundersquall	Damage to tenant houses, outbuildings and barns; path short.	Do.
Kearney County, Kans.	25	P.m.	[1] 1		6,000	Heavy hail	All growing crops destroyed; path 15 miles long.	Do.
Pomona, Mo.	25			2	2,000	Tornado	2 persons injured; property damaged.	Do.
Lapeer County, Mich., southeastern portion.	26	3 p.m.	34–217		45,000–100,000	Tornado and heavy rain.	Damage to farm buildings, orchards and other property; path 50 miles long.	Do.
Richmond, Va.	26	6:34–6:58 p.m.	[1] 1		8,000	Thundersquall	Overhead wire systems torn down; roofs ripped off; many trees broken or blown down.	Do.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, MAY 1933—Continued

Place	Date	Time	Width of path (yards)	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Greenville, S.C.	27	12:25–1:55 p.m.			$500	Thundersquall	Buildings damaged	Official, U.S. Weather Bureau.
Logan, Thomas, and Gove Counties, Kans.	27	3 p.m.	[1] 4		50,000	Heavy hail	Damage to corn, barley, gardens and trees; most severe part of storm at Oakley and Campus; path 10 miles long.	Do.
Walterboro, S.C.	27	4 p.m.			3,000	Thundersquall	2 persons injured; damage to 2 dwellings and several outbuildings.	Do.
Northeastern Cherry County, Nebr.	27	4:30–5:30 p.m.	[1] 10			Heavy hail	Little damage owing to crops not being far enough advanced; path 25 miles long.	Do.
Nemaha County, Kans.	27	P.m.	[1] 2			do	Crops destroyed; poultry, horses, and mules killed; path 20 miles long; loss not estimated.	Do.
Montgomery, Kans.	28	P.m.	[1] 10			Heavy hail	Roofs, barns, and other buildings demolished; windows smashed, crops ruined; livestock injured and poultry killed; path 15 miles long.	Do.
Connecticut, southern position.	28					Electrical	Telephone and electric cables damaged; 5 trolley cars, church steeple, and tenement house struck by lightning.	Do.
New Hope, Tex.	29	12:20 a.m.		1	300	Wind	Several buildings damaged	Do.
Ulysses, Kans.	29					Hail	Hail a foot deep on highway, delaying traffic	Do.
Madison (near), Fla.	30	4 p.m.			1,000	Wind and hail	Loss in tobacco crop; timber blown down	Do.
Honesdale, Pa.	31	P.m.			35,000	2 severe thunderstorms.	Damage chiefly from flooding; rainfall heaviest in years.	Do.
Burdett, Kans. (south of).	31					Wind and hail	Cattle and chickens killed; wheat total loss	Do.
Felix River headwaters.	31	3:45 p.m.	[1] 3		10,000	By hail	200 cattle killed, $1,000 crop loss	Clement Hendricks.

[1] Miles instead of yards.

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Chart I. Departure (°F.) of the Mean Temperature from the Normal, May, 1933

Chart I. Departure (°F.) of the Mean Temperature from the Normal, May, 1933

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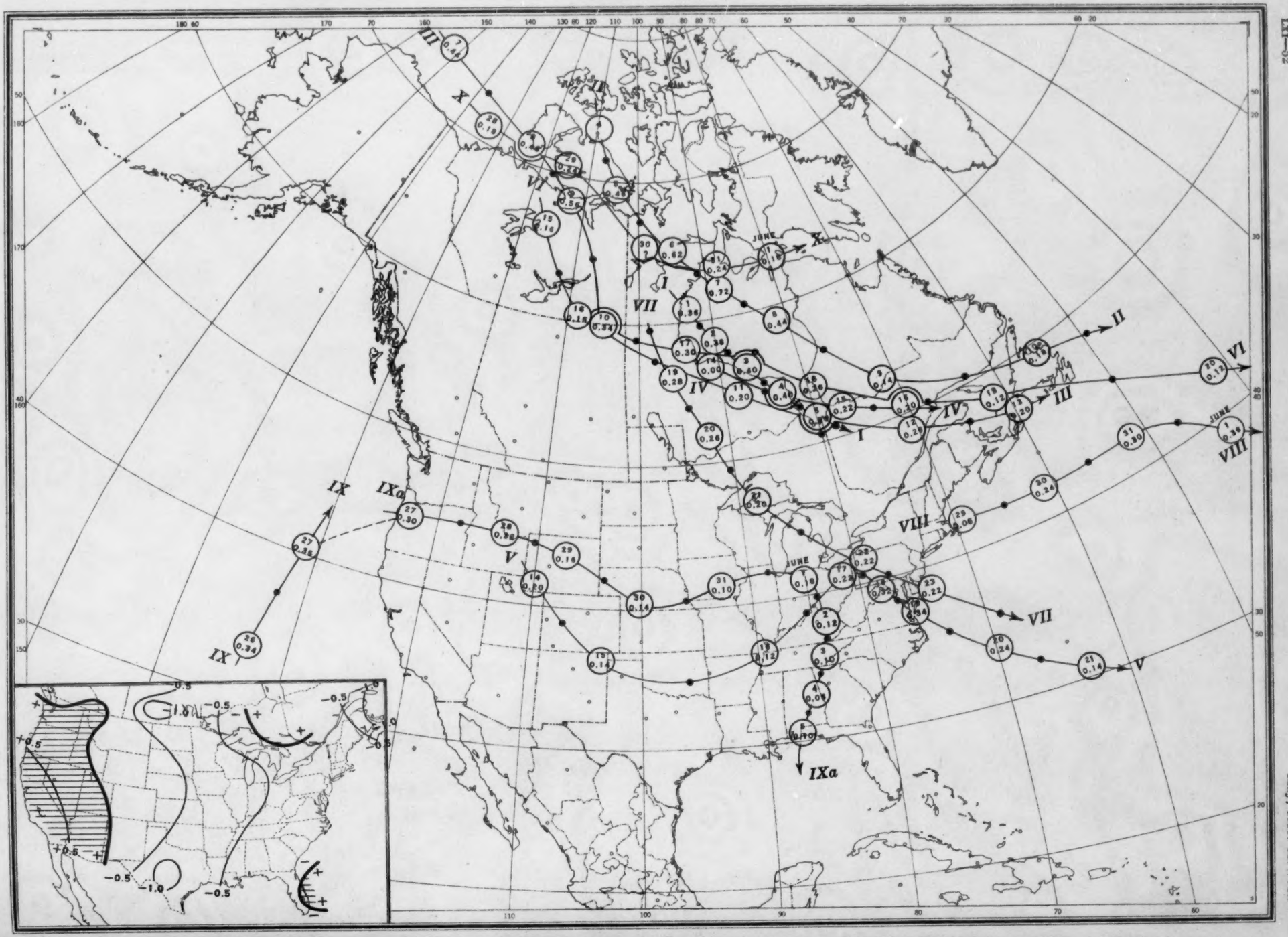
Chart II. Tracks of Centers of Anticyclones, May, 1933. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by G. E. Dunn)



Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

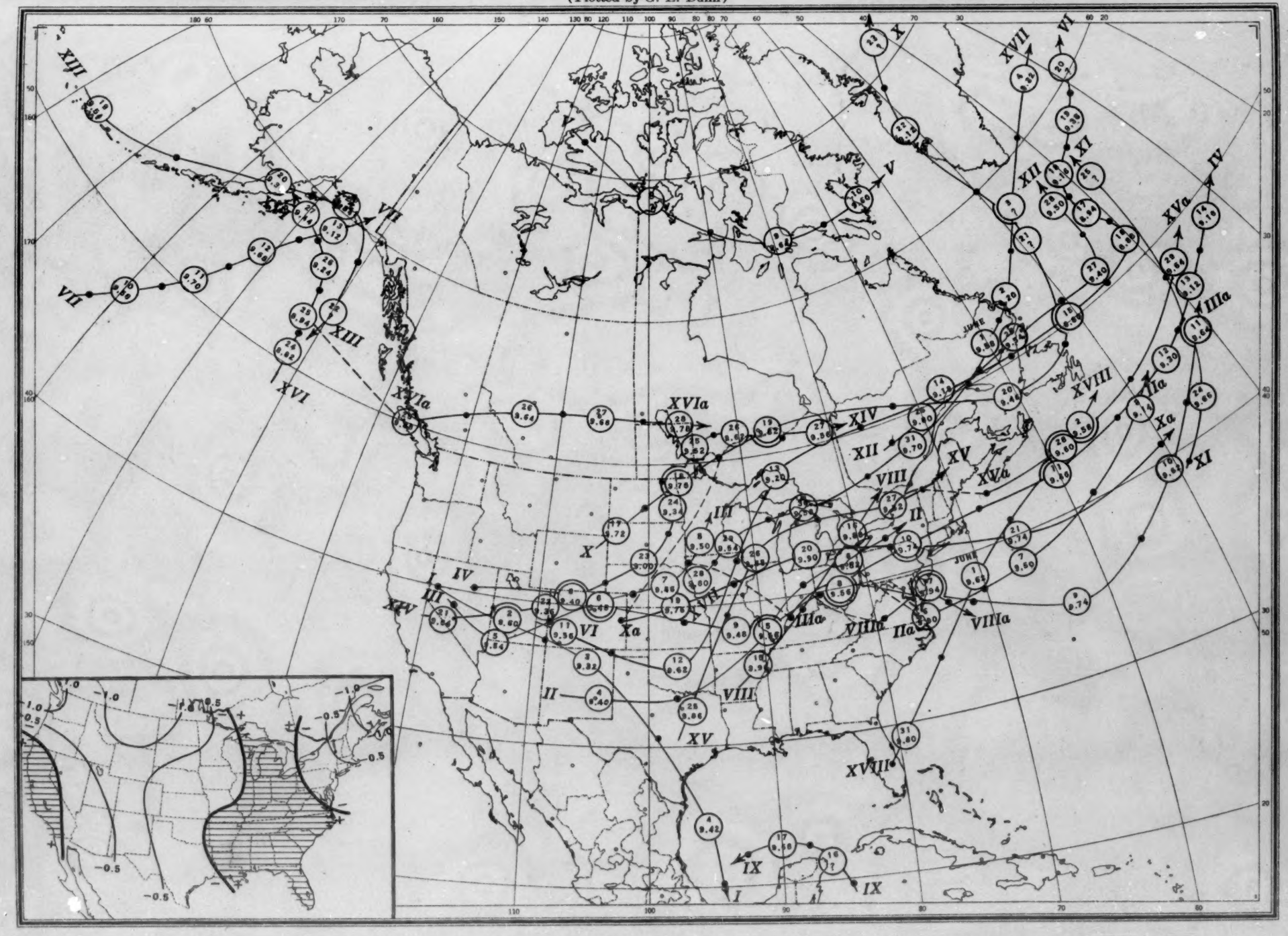
Chart III. Tracks of Centers of Cyclones, May, 1933. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by G. E. Dunn)

Circle indicates position of anticyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 8 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, May, 1933. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by G. E. Dunn)



Circle indicates position of cyclone at 8 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 8 p. m. (75th meridian time).

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Chart IV. Percentage of Clear Sky between Sunrise and Sunset, May, 1933

Chart V. Total Precipitation, Inches, May, 1933. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, May, 1933. (Inset) Departure of Precipitation from Normal

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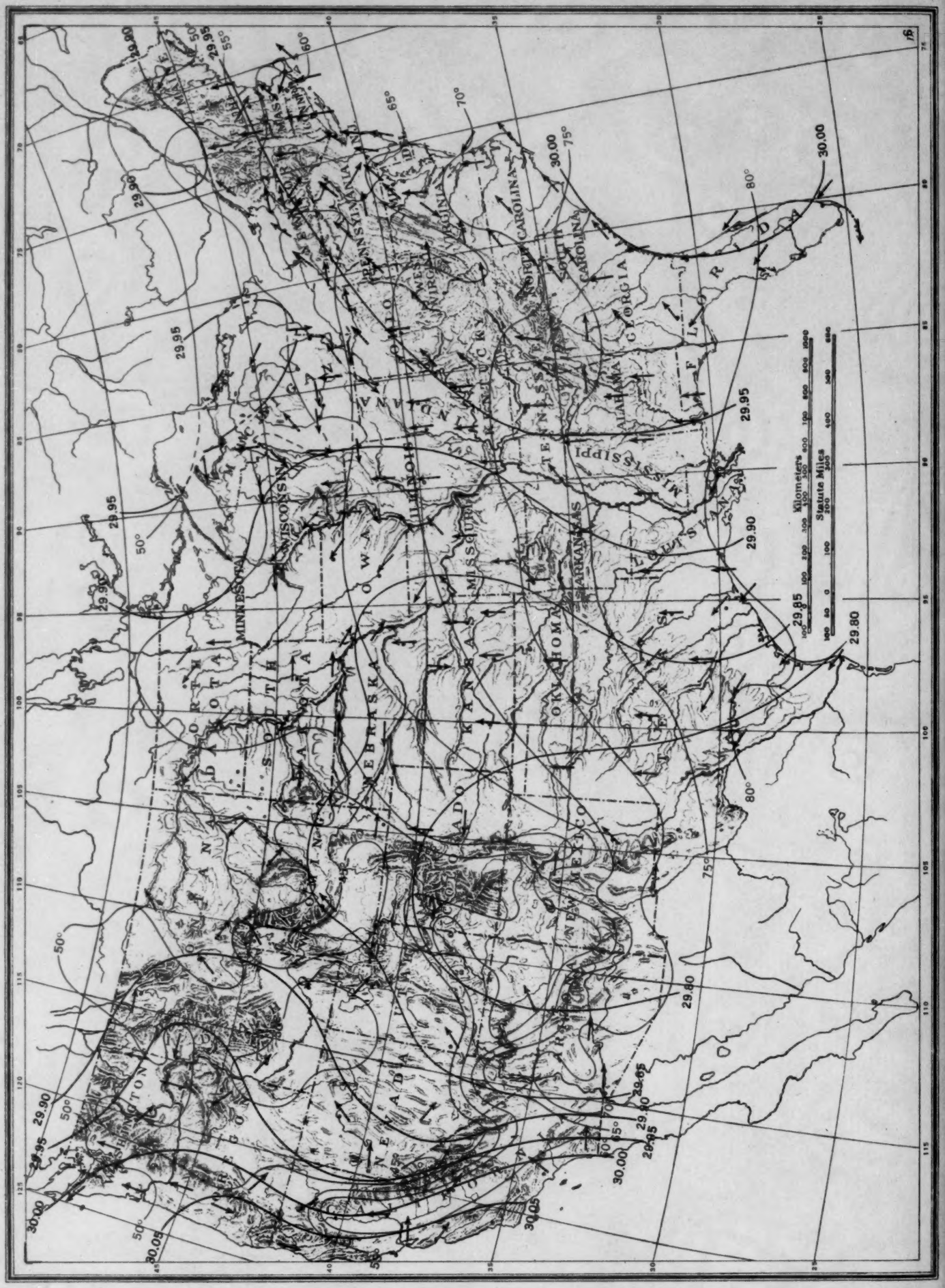

Chart VI. Isobars at Sea level and Isotherms at Surface; Prevailing Winds, May, 1933